ENERGY FACILITY SITING BOARD SITING REPORT

F184N-4&5 / E183-3 Bristol & Warren Tap 115kV Line Rebuild Project

Warren and Bristol, Rhode Island

PREPARED FOR

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Glossary

AC:	Alternating Current. An electric current which reverses its direction of flow periodically. (In the United States this occurs 60 times a second --60 cycles or 60 Hertz). This is the type of current supplied to homes and businesses.
ACSR:	Aluminum Conductor Steel Reinforced wire
ACSS:	Aluminum Conductor Steel Supported wire
AFUDC:	Allowance for Funds Used During Construction – financing costs incurred in association with new construction
Ampere (Amp):	A unit of measure for the flow of electric current. A typical home service capability (i.e., size) is 100 amps. 200 amps or more is required for homes with electric heat.
ANSI:	American National Standards Institute
BMPs:	Best Management Practices
Cable:	A fully insulated conductor installed underground.
Circuit:	A system of conductors (three conductors or three bundles of conductors) through which an electric current is intended to flow and which may be supported above ground by transmission structures or placed underground.
Conductor:	A metallic wire or cable which serves as a path for electric current to flow.
CRMC:	Coastal Resources Management Council
CRMP:	Coastal Resources Management Plan
dB(A):	Decibel, on the A-weighted scale. A decibel is a logarithmic unit of measurement that expresses the magnitude of a sound. A-weighting is used to emphasize the range of frequencies where human hearing is most sensitive.
Danger Tree:	Any tree on or off the right-of-way that could contact electric supply lines.
Davit Arm:	An upswept cantilevered steel beam attached to a supporting structure that is used to support mechanical loads from wires and accessories.
Demand:	The total amount of electric power required at any given time by an electric supplier's customers.
Distribution Line or System:	Power lines that operate between 4 kV and 35 kV that transport electricity to the customer.
EFSB:	Rhode Island Energy Facility Siting Board

Electric Field (EF):	A field produced as a result of voltages applied to electrical conductors and equipment; usually measured in units kilovolts per meter.
Electric Transmission:	The facilities (≥69 kV) that transmit electrical energy from generating plants to substations.
EMF:	Electric and magnetic fields
Environmental Monitor:	Inspects environmental conditions within the construction site, reviews the contractors' compliance with environmental permit conditions during the construction phase of a project, and makes recommendations for corrective actions to protect sensitive environmental resources proximate to a construction site.
Fault:	A failure or interruption in an electrical circuit (a.k.a. short circuit).
FAA:	Federal Aviation Administration
FEMA:	Federal Emergency Management Agency
Gauss (G):	A unit of measure for magnetic fields. 1G equals 1,000 milliGauss.
Glacial till:	Type of surficial geologic deposit that consists of boulders, gravel, sand silt, and clay mixed in various proportions. These deposits are predominantly nonsorted, nonstratified sediment and are deposited directly by glaciers.
Gneiss:	Light and dark, medium- to coarse-grained metamorphic rock characterized by compositional banding of light and dark minerals, typically composed of quartz, feldspar and various amounts of dark minerals.
H-frame Structure:	A wood or steel transmission line structure constructed of two upright poles with a horizontal cross-arm and diagonal bracings.
Hz:	Hertz, a measure of the frequency of alternating current; expressed in units of cycles per second.
IEEE:	Institute of Electrical and Electronic Engineers
ISO-NE:	ISO New England, Inc. The independent system operator of the electric transmission system in New England.
kcmil:	1,000 circular mils, approximately 0.0008 square inches. A measure of conductor cross-sectional area.
kV:	Kilovolt. 1 kV equals 1,000 volts.
kV/m:	Kilovolts per meter. A measurement of electric field strength.
Load:	Amount of power delivered upon demand at any point or points in the electric system. Load is created by the power demands of customers' equipment (residential, commercial, and industrial).
mG:	milliGauss. Equals 1/1000 Gauss (see Magnetic Field).

MVA:	Megavolt Ampere. Measure of electrical capacity equal to the product of the voltage, the current and the square root of 3 for three-phase systems. Electrical equipment capacities are sometimes stated in MVA.
MW:	Megawatt. Megawatt equals 1 million watts. A measure of the work electricity can do.
NESC:	National Electrical Safety Code
Overhead:	Overhead. Electrical facilities carried above-ground on supporting structures.
OPGW:	Optical ground wire
Phase:	Transmission and distribution AC circuits are comprised of three conductors that have voltage and angle differences between them. Each of these conductors is referred to as a phase.
Project ROW:	The limits of the easements and fee ownership that form the F184N-4&5 / E183-3 Bristol & Warren Tap Corridor
Reconductor:	Replacement of existing conductors with new conductors, and any necessary structure reinforcements or replacements.
Reinforcement:	Any of a number of approaches to improve the capacity of the transmission system, including rebuilding, reconductoring, uprating, conversion and conductor bundling methods.
RIDEM:	Rhode Island Department of Environmental Management
RIDEM LRSMM	Rhode Island Department of Environmental Management Office of Land Revitalization and Sustainable Materials Management
RIDOT:	Rhode Island Department of Transportation
RIGIS:	Rhode Island Geographic Information System
R.I.G.L.:	Rhode Island General Laws
RIHPHC:	Rhode Island Historic Preservation and Heritage Commission
RINHP:	Rhode Island Natural Heritage Program
RIPDES:	Rhode Island Pollutant Discharge Elimination System
ROW:	Right-of-way. Corridor of land within which a utility company holds legal rights necessary to build, operate and maintain power lines.
Schist:	Light, silvery to dark, coarse to very coarse-grained, strongly to very strongly layered metamorphic rock whose layering is typically defined by parallel alignment of micas. Primarily composed of mica, quartz and feldspar; occasionally spotted with conspicuous garnets.

Shield Wire:	Wire strung at the top of transmission lines intended to prevent lightning from striking transmission circuit conductors. Sometimes referred to as static wire or aerial ground wire. May contain glass fibers for communication use. See also OPGW.
Steel Pole Structure:	Transmission line structure consisting of tubular steel pole(s) with arms or other components to support insulators and conductors.
Substation:	A fenced-in yard containing switches, power transformers, line terminal structures, and other equipment enclosures and structures. Voltage change, adjustments of voltage, monitoring of circuits and other service functions take place in this installation.
TMDL:	Total Maximum Daily Load, Maximum allowed pollutant load to a water body without exceeding water quality standards.
Transmission Line:	An electric power line operating at 69,000 or more volts.
USDA:	United States Department of Agriculture
USFWS:	United States Fish and Wildlife Service
USGS:	United States Geological Survey
V/m:	Volts per meter. A measure of electric field strength.
Voltage:	A measure of the electrical pressure which transmits electricity. Usually given as the line-to-line root-mean square magnitude for three-phase systems.
Watercourse:	Rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and all other bodies of water, natural or artificial, public or private.
Wetland:	Land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial or floodplain by the U.S. Department of Agriculture, Natural Resources Conservation Service. Wetlands include federally jurisdictional wetlands of the U.S. and navigable waters, freshwater wetlands or coastal resources regulated by a state or local regulatory authority. Jurisdictional wetlands are classified based on a combination of soil type, wetland plants, and hydrologic regime, or state-defined wetland types.
Wire:	See Conductor.
WLCT:	Warren Land Conservation Trust

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Executive Summary

1.1 Introduction

This Siting Report (SR) will support the application to the Rhode Island Energy Facility Siting Board (EFSB) and other agencies by The Narragansett Electric Company (TNEC or the Company) [1] in connection with rebuilding the F184N-4/5 and E183-3 115kV Transmission Lines (F184N-4/5 and E183-3 Lines) from the Massachusetts/Rhode Island (MA/RI) boundary west of Market Street in Warren, Rhode Island to the Bristol Substation at 99 Gooding Avenue in Bristol, Rhode Island (the Project).

This SR has been prepared under the direction of Doug Grossman, P.E., TNEC Siting Manager for the Project. Numerous employees of TNEC, including planners, engineers and legal personnel contributed to the SR. The description of the affected natural and social environments, and impact analyses were prepared by VHB and other consultants to TNEC including The Public Archaeology Laboratory, Inc. (PAL) for cultural resources, Exponent, Inc. for analysis of health effects of electric and magnetic fields (EMF) and EMF calculations , and Sargent and Lundy for engineering, design and EMF calculations (for F184N-4/5 and E183-3 Lines).

This SR has been prepared in accordance with the EFSB Rules to provide information on the potential impacts of the electric transmission system improvements proposed by TNEC. This SR details the Project, discusses the alternatives considered and analyzed for the Project, describes the specific natural and social features that have been assessed for the evaluation of impacts, discusses potential impacts, presents a mitigation plan for potential impacts associated with the construction of the Project, and describes permit requirements.

The purpose and need for the Project are detailed in Section 2 of this SR, which includes a description of the studies and forecasts regarding the need for the proposed transmission system improvements. Section 3 provides a detailed description of each of the components of the Project and additionally discusses construction practices, right-of-way (ROW) maintenance practices, EMF, safety and public health considerations, community outreach, estimated Project costs, and anticipated Project schedule. An analysis of alternatives to the Project, together with reasons for the rejection of each alternative, is presented in Section 4 of this SR. A detailed description of all environmental and social characteristics within and immediately surrounding

1 TNEC, a subsidiary of PPL Corporation, is an electricity distribution and transmission company serving approximately 777,000 customers in 38 Rhode Island communities. PPL Corporation is a public utility holding company.

the proposed Project locations is included as Sections 5 and 6, respectively. Section 7 of this SR identifies the impacts of the Project on the natural and social environments both on and off site. Finally, Section 8 summarizes proposed mitigation measures, which when implemented, will effectively offset impacts associated with the Project.

Compliance with the requirements of Rule 1.6 of the EFSB Rules of Practice and Procedure (the EFSB Rules) is addressed in the Project Application, which is filed with the EFSB herewith.

1.2 Project Description and Proposed Action

TNEC is proposing to rebuild the existing F184N-4/5 and E183-3 Lines between the MA/RI boundary in Warren, RI and the Bristol Substation at 99 Gooding Avenue in Bristol, RI to address asset health concerns. The F184N-4 and E183-3 Lines occupy a shared right of way (ROW) approximately 200 feet wide between the MA/RI boundary and the Warren Substation at 34 Norbert Street in Warren, a distance of approximately 1.9 miles. The F184N-5 Line is within a ROW approximately 150 feet wide between the Warren Substation, and the Bristol Substation, a distance of approximately 3.3 miles. The F184N-4/5 and E183-3 Lines will be rebuilt and include the replacement of the existing wood structures with steel structures and the replacement of the associated overhead equipment and conductors. The Project will reinforce and enhance the reliability of the existing transmission system in Warren and Bristol.

TNEC is proposing to rebuild three existing 115kV transmission lines: the F184N-4/5 and E183-3 Taps to the Warren Substation. Figure 1-1[2] provides an overview of the Project location and Figure 1-2 (sheets 4 through 22) provides more detail regarding the Project alignment.

1.3 Purpose and Need

TNEC strives to provide its customers with high quality, reliable electric service at the lowest possible cost, while minimizing adverse environmental and social effects. Reliability is measured in terms of the frequency and duration of power outages . The quality of electric service refers to voltage levels, variations in voltage frequency, and harmonic content.

The Company owns and operates approximately 400 miles of overhead and underground transmission lines exclusively in the State of Rhode Island. The system needs are identified through a combination of data collection activities, including desktop review, ground inspections, aerial inspections, and third-party condition assessments. The Company utilizes the collected data to apply a proactive asset management strategy to upgrade or rebuild transmission facilities to improve reliability and the longevity of the system while reducing maintenance costs.

Since 2020, TNEC has documented 12 outages, nine momentary and three permanent on the F184N Lines and ten outages, six momentary and four permanent, on the E183. The outages were attributed to interference from avians and avian nest debris, interference from vegetation, lightning, weather not involving lightning, interference from other utility or distribution equipment, failed alternating current (AC) substation equipment, failed protection system equipment, fire, unclassified interference, and unknown causes. The most recent documented

2 All figures bound separately.

outage on the F184N- Line occurred on June 26, 2024. The most recent documented outage on the E183 Line occurred on April 11, 2024.

If the F184N-4/5 and E183-3 Lines are not rebuilt, then the service area may face future reliability issues like loss of electric service, as well as safety risks resulting from the asset conditions of the Lines. The Project is needed to address the asset condition issues of the existing lines.

1.4 Alternatives

An analysis was undertaken to evaluate alternatives, and their respective feasibility, to the proposed transmission system improvements. TNEC evaluated multiple alternatives to the F184N-4/5 and E183-3 Rebuild Project, including the No-Action Alternative and a Structure Replacement Alternative. Feasibility assessments, cost considerations, reliability assessments, and impact assessments were used to evaluate the alternatives. The results of the alternatives analysis confirm that the proposed Project will address the reliability issues in the most cost-effective manner while minimizing impacts to the social and natural environments.

1.5 Summary of Environmental Effects and Mitigation

The proposed Project will be designed and constructed in a manner that will minimize and mitigate the potential for adverse environmental impacts. The Project will have minimal impact on the geologic, soil, surface water, and groundwater characteristics of the corridor, and although the Project traverses freshwater and coastal wetlands, it may result in minimized adverse effect to wetland resources in the F184N-4/5 and E183-3 Lines ROWs (Project ROW).

VHB performed an inventory of the Project ROW and a review of record data to identify any rare, threatened, or endangered (RTE) species within the ROW. Construction of the Project has been planned to avoid impact to RTE species to the extent practicable.

The proposed rebuild of the transmission lines may have minimized adverse effects on excavated soil due to water and wind erosion. This may result in minor siltation of water bodies and wetlands. However, these impacts will be short-term and localized. To ensure that these impacts are minimized, standard Best Management Practices (BMPs) such as the installation of erosion control devices (i.e., compost filter sock (CFS), silt fence, etc.) and the reestablishment of vegetation will be employed to minimize wetland and water quality impacts within the non-tidal portions of the project.

The Project is designed to reduce wetland impacts through measures including avoidance, minimization, and mitigation (where required by the Coastal Resources Management Council (CRMC), the Rhode Island Department of Environmental Management (RIDEM) and the U.S. Army Corps of Engineers (USACE)). Construction of the Project may result in minor temporary impacts to coastal and wetland resources caused by vegetation mowing, and construction mat installation for access to structures and work areas. Additionally, some minor permanent impacts will result from the placement of fill required for the directly embedded structures and new structure foundation construction.

Approximately 2,177 square feet (SF) of coastal and freshwater wetlands will be permanently altered due to placement of fill material. These permanent alterations are unavoidable because

55 of the transmission structures are within state- and federal-regulated coastal and freshwater wetlands.

Approximately 0.5 acres of tree clearing will be necessary for the reconfiguration of the E183-3 and F184N-4 Tap Lines into Warren Substation of which approximately 1,791 SF is within state- and federal-regulated Palustrine Wetland and 20,859 SF is within state- regulated 200-foot Contiguous Area. Additionally, The Company will remove "danger trees" along the edges of the ROW.

Element occurrence records of State listed rare, threatened, and endangered species for nine plant species and one reptile species were identified within the Project ROW. Species data and location of element occurrence records were provided by the Rhode Island Natural Heritage Program and the Warren Land Conservation Trust which manages a portion of the Project ROW in Warren. Access roads and work pads have been planned to avoid known occurrence records of rare species to the greatest extent possible.

In addition to these mitigation measures, the services of an environmental monitor will be retained throughout the construction phase of the Project. The purpose of the environmental monitor will be to ensure compliance with applicable federal, state, and local permit conditions, to maintain strict adherence to The Narragansett Electric Company construction Best Management Practices (BMP), and to monitor the effectiveness of BMPs and make adjustments as necessary.

1.6 Summary of Social Effects and Mitigation

Because the Project is within an established ROW, it will not require, nor will it lead to, long-term residential or business disruption. Temporary construction impacts primarily related to construction traffic and equipment operation are expected to be minor. The construction of the Project, as described herein, will not adversely impact the overall social and economic condition of the Project area.

1.6.1 Population

Population trends within the two host communities were evaluated by reviewing available data from the US Census Bureau and the Rhode Island Statewide Planning Office. Between 2000 and 2020, the population within the Town of Bristol increased by 24 individuals. The RI Statewide Planning Office is projecting a further increase of 0.64 percent between 2020 and 2030 for the Town of Bristol. Between 2000 and 2020, the population within the Town of Warren decreased by 213 individuals. The RI Statewide Planning Office is projecting a continued decrease of 13.52 percent between 2020 and 2030 in the Town of Warren. These trends are not expected to be affected by the Project.

1.6.2 Employment

Employment trends within the host communities were evaluated by reviewed data published by the RI Department of Labor and Training. During the period between 2000 and 2024, employment estimates in Bristol increased from 12,106 to 12,484. During the same period, employment estimates in Warren decreased from 6,240 to 5,994. The Project is not expected to have an effect on employment and Tax Revenue within Bristol County.

1.6.3 Land Use

Land Use within the Study Area contains residential areas, and other land uses including recreational, commercial, industrial, institutional, agricultural, forest, and wetland/open water. Several areas of protected open space are present along the Project ROW. These existing land uses will not be altered by the F184N-4/5 and E183-3 Lines Project because the Project is within an existing developed transmission corridor. The Project ROW has supported electric utility infrastructure and been subject to routine maintenance activities such as vegetation mowing for several decades.

1.6.4 Visual Resources

The proposed replacement transmission lines and supporting structures will be slightly more visible than the existing transmission lines. This is due to their greater height and visual mass, when compared to the existing lines. However, their visual impact is substantially mitigated through the use of the existing transmission line ROWs for the proposed structures, and the fact that additional tree clearing is not required along the majority of the ROW. Tree clearing will be required to accommodate the reconfigured taps at the Warren Substation, approximately 22,650 SF of fringe woodland are proposed to be cleared. No grubbing will be needed and the ROW areas cleared of trees will be managed to promote the establishment of shrubs. An approximately 50-foot natural woodland buffer would remain between the Bike Path and the reconfigured Taps west of the Warren Substation. Visual impacts to the bike path are expected to be minimal.

The combined effect of vegetation (forest areas, street trees, and yard vegetation) and buildings throughout the study area screen (or partially screen) views of the Project from many locations. In the northern portion of the study area open views of the existing lines and structures are available in agricultural and open space recreational areas crossed by the ROW. There are fewer residential and commercial developments abutting the northern portion of the Project ROW than the central and southern portions. Beyond the direct abutting properties, the neighboring commercial and residential properties, are screened by vegetation and buildings in the northern portion of Project ROW. Several roads off Market Street end at the edge of the salt marsh and have open views to the ROW but are limited to the residences and commercial buildings immediately abutting the salt marsh. In the central and in the majority of the southern portion of the study area, the existing lines and structures are visible from streets and yards immediately adjacent to the Project ROW, including subdivisions where houses have been built in close proximity to the line. Near the southern terminus of the Project ROW, the F184N-5 line is within the Bristol Municipal Golf Course and open views of the existing line and structures are available throughout the course. The Bristol Municipal Golf Course is surrounded to the east and west by industrial development including structures two to three stories in height as well as two salvage yards and an excavation company laydown/material staging area. In developed areas located more than approximately 0.25-mile from the Project, the combination of screening provided by buildings, trees, and other vegetation in yards and along roadsides effectively obscured views toward the Project site.

1.6.5 Noise

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, or recreation. Loudness is the sound pressure level measured on a logarithmic scale in units of decibels (dB). For community noise impact assessment, sound level frequency characteristics are based upon human hearing, using an A weighted (dB(A)) frequency filter.

The F184N-4/5 and E183-3 Lines are not expected to generate sound under normal operating conditions. Temporary minor construction noise may be generated during normal working hours. Noise impacts are expected to be negligible and would cease once construction was completed. Noise may go beyond normal work hours for tasks that must be completed once started (i.e., concrete pours, line stringing). In tidal wetland areas, TNEC may perform foundation construction 24-hours per day to minimize construction time within the marsh and to avoid forecasted above normal high tides.

1.6.6 Cultural – Rebuilding F184N-4/5 and E183-3 Lines

On behalf of TNEC, The Public Archaeology Laboratory ("PAL"), initiated a cultural resource due diligence review for the Project in May 2024. PAL recommended the project may affect historic properties and the need for consultation with the Rhode Island Historic Preservation and Heritage Commission (RIHPHC). The RIHPHC concurred with these findings and asked to further identify historic properties and that an effects assessment for aboveground resources and a Phase I archaeological survey be conducted (see correspondence from RIHPHC dated August 28, 2024, in Appendix B). TNEC will also consult with the U.S. Army Corps of Engineers (USACE) regarding potential effects the Project may have on properties potentially eligible, eligible or listed in the National Register of Historic Places.

1.6.7 Transportation

Transportation infrastructure within the Study area includes both State routes and local roadways. The ROW crosses or abuts one State road and 14 town roads which will be utilized to access the ROW as well as the Warren and Bristol Substations. Construction related transportation impacts will be mitigated through the implementation of a transportation management plan including industry standard safety measures, coordination with municipalities, and a robust public outreach program.

1.6.8 EMF

EMF is a term used to describe electric and magnetic fields that are created by voltage (electric field) and electric current (magnetic field). TNEC, like all North American electric utilities, supplies electricity at 60 Hertz (Hz). Therefore, the electric utility system and the equipment connected to it, produce 60-Hz (power-frequency) EMF. These fields can be measured using instruments and can be calculated using a computer model.

TNEC has modeled the EMF associated with the existing F184N-4/5 and E183-3 Lines and the rebuilt F184N-4/5 and E183-3 Lines. At both average and peak loading, 60-Hz EMF levels at the ROW edges were calculated to decrease or not significantly change as a result of the Project rebuild. The ROW-edge electric- and magnetic-field levels (at average loading) after construction were calculated not to increase by more than 0.1 kilovolts per meter (kV/m) and 0.3 milligauss (mG) compared to existing levels. The maximum post-project ROW-edge electric- and magnetic-field levels anywhere on the route were calculated to be 0.2 kV/m and 2.7 mG, respectively. At peak loading, magnetic-field levels at the ROW edges were calculated to not exceed 4.2 mG at 5 years post-construction as a result of the Project. At all locations on the ROW and beyond, calculated EMF levels are far below the guidelines of international scientific and health agencies for electric fields (4.2 kV/m or greater) and magnetic fields (2,000 mG or greater).

1.7 Conclusion

Completion of the Project as proposed by TNEC will address the electric reliability needs of the Towns of Warren and Bristol in a cost-effective manner which minimizes environmental and social impacts. Mitigation will be provided for all impacts to state and federal regulated wetland resources. Impacts to rare, threatened, or endangered species will be limited through appropriate avoidance or minimization techniques. Similarly, impacts to cultural resources will be avoided through investigation and coordination with the RIHPHC. The potential for significant impact to other environmental or social receptors in the Project vicinity is expected to be minimal.

To the extent that impacts cannot be avoided, they will be addressed through mitigation techniques as discussed in Section 8 of this SR.

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Purpose and Need

2.1 Introduction

TNEC strives to provide its customers with high quality, reliable electric service at the lowest possible cost, while minimizing adverse environmental and social effects. Reliability is measured in terms of the frequency and duration of power outages. The quality of electric service refers to voltage levels, variations in voltage frequency, and harmonics.

TNEC is proposing to rebuild the existing F184N-4/5 and E183-3 Lines between the MA/RI boundary in Warren, RI and the Bristol Substation at 99 Gooding Avenue in Bristol, RI to address asset health concerns. The F184N-4 and E183-3 Lines reside between the MA/RI boundary and the Warren Substation at 34 Norbert Street in Warren, a distance of approximately 1.9 miles. The F184N-5 Line resides between the Warren Substation, and the Bristol Substation, a distance of approximately 3.3 miles. The F184N-4/5 and E183-3 Lines will be rebuilt which includes the replacement of the existing wood structures with steel structures and the replacement of the associated overhead equipment and conductors. The Project will reinforce and enhance the reliability of the existing transmission system in Warren and Bristol.

Since 2020, TNEC has documented 12 outages, nine momentary and three permanent, on the F184N Lines. The momentary outages were caused by interference from avians (two outages), interference from vegetation (two outages), weather excluding lightning (two outages), interference from other utility or distribution equipment (one outage), failed protection system equipment (one outage), and an unknown cause (one outage). The permanent outages were caused by unclassified foreign interference (two outages) and an unknown cause (one outage). The most recent documented outage of the F184N Lines occurred on June 26, 2024. TNEC has documented ten outages, six momentary and four permanent, on the E183 Line since 2020. The momentary outages were caused by interference from avian nest debris (three outages), lightning (one outage), fire (one outage), and interference from other utility or distribution equipment (one outage). The permanent outages were caused by failed AC substation equipment (one outage), interference from other utility or distribution equipment (one outage), interference from avian nest debris (one outage), and an unknown cause (one outage). The most recent documented outage of the E183 Line occurred on April 11, 2024.

The current E183-3 and F184N-2 serve Warren substation and Bristol Transformer 1. Warren substation supplies 59.8 MVA to serve 27,696 customers in Warren, Barrington, Bristol, and East

Providence. Bristol Transformer 1 supplies 14 MVA to serve 5,497 customers in Bristol. Loss of both lines to Warren and Bristol substations can interrupt up to 73.8 MVA of load and 33,193 customers served by Warren and Bristol substations.

The F184N-4 and E183-3 Lines north of the Warren Substation to the Massachusetts/ Rhode Island Boundary contain a total of 52 structures to be replaced. The F184N-5 Line between the Warren and Bristol Substation contains 53 structures to be replaced. The Taps are primarily supported by wood H-frame structures which are more susceptible to osprey nesting and vegetation contacts.

The structures and conductor along the Lines have reached the end of their expected useful life. The majority of the structures on the F184N-4/5 and E183-3 lines were installed in the 1980's and the conductor was installed in the 1960's.Assets at or near the end of their expected useful life are at an increased likelihood of failure and need to be addressed to maintain system reliability and, most importantly, public safety. Continuing to perform extensive maintenance on aging assets is typically not a financially prudent option for customers and does not fully mitigate the risk of component failure. Failure of infrastructure may result in system reliability issues, long outages for customers, dangerous conditions for the public, damage to nearby facilities, expensive repairs, or other negative impacts. Age is an important factor when determining end of life; however, it is not the only factor. Factors such as design, material, environment, manufacturer, inspection data and maintenance history all influence the useful life of an asset.

Recent aerial inspections identified numerous deficiencies on the wood pole population, including woodpecker damage, rotting, pole top deterioration, and loose X-braces. These deficiencies impact the structural integrity of the wood poles, increasing the likelihood of structure failure. An example of this is when wood structures shrink as they age as water leaves the crossarm and pole. As the crossarms and pole shrink, this allows room for water in the attachment points, leading to possible water ingress and deterioration at attachment points. A recent example of this occurred on 7/1/2025 when a crossarm failed on the PA Transmission Line Hauto-Frackville 1. This caused a permanent outage, interrupting service to nearly 7,000 customers. Oftentimes as wood poles are treated, the treatment does not fully reach the center of the crossarms. In addition to the identified pole defects, failed insulators, backed out cotter keys, broken pole grounds, and broken conductor jumper strands have also been identified through inspections of the structures. These hardware pieces are critical to keep insulator strings connected to the conductor and to protect both the transmission assets and public from safety concerns if the assets were to fail. Furthermore, inspections only identify obvious defects and are not effective at identifying underlying concerns such as internal decay. However, visible structure defects generally coincide with defects below the surface, indicating poor overall structure condition.

The conductors of the Tap Lines were installed in the 1960's and are at the end of their expected useful life. Recent inspections show signs of broken strands, though not all damage to conductor can be visible through visual inspections. The existing conductors on the Lines are 1113 ACSR (F184N-4), 1113 AAC (E183-3), 636 AAC and 2/0 CU (F184N-5). The lifespan of these conductors can be influenced by poor splices, improper installation of compression fittings, oxidation and corrosion, lightning strikes, and damage caused by debris or other external forces. According to the Institute of Electrical and Electronics Engineers ("IEEE"), the main concern for the ACSR (Aluminum Conductor Steel Reinforced) conductor is the end of life of the galvanization on the steel core and subsequent corrosion. This corrosion, while typically not visible from the outside of the conductor, can compromise the mechanical strength of the conductor, leading to possible conductor failure.

While they do not have a steel core, AAC (All Aluminum Conductor) and CU (copper conductor) are still susceptible to corrosion and annealing, both of which reduce mechanical strength and can lead to broken strands and conductor failure. Frequent outages and exposure to fault currents over the life of the conductor can increase the likelihood of annealing, decreasing the tensile strength and leaving the conductor brittle. They are also vulnerable to oxidation and corrosion from the nearby waterways, which can decrease the longevity of the asset and increase the likelihood of failure.

Replacing the existing shieldwire with OPGW (Optical Ground Wire) will allow for a fiber optic communication path between substations for relay communication and the ability to install remotely operated switches. Additionally, the OPGW that will be installed during the Project will provide shielding angles and protection from lightning strikes consistent with our current design standards.

Inspections performed on the F184N-4/5 and E183-3 Lines in 2023 identified osprey nests on two of the H-frame structures on the line. The close proximity to the Belcher Cove and the flat, horizontal surface of H-frame structures provide a space for osprey to nest, which may interfere with overhead line equipment and increase the likelihood of avian mortality. An example of this occurred April 23, 2023 when debris from an osprey nest contacted the line causing 4 outages over a 7-hour time frame. This resulted in 4 momentary interruptions for 14,725 customers each time for a total MAIFI impact of 58,900 customers. The Project will install structures with improved framing and clearances that will mitigate the potential for avian interference, thus reducing the impact to the avian population in this area and improving customer reliability.

Continuing to maintain the lines is not a financially prudent or practical option as it increases the risk of failures and outages, threatening reliability and public safety. It also does not address the concerns of structure, conductor, and shieldwire condition, lightning risk, or the risk of osprey nesting due to structure design and proximity to water. The Project will improve the quality and reliability of electric supply to the area by rebuilding the existing transmission line. This will enable TNEC to continue to provide reliable electric supply to its customers in Warren and Bristol.

2.2 Transmission Planning Process

TNEC routinely assesses the physical condition and operating record of its existing transmission and distribution facilities to ensure that they will provide reliable service to customers. Concerns with the condition of existing facilities (also known as asset condition issues) may be addressed on a stand-alone basis, or as part of a reliability-driven project.

2.3 Conclusions

If the F184N-4/5 and E183-3 Lines are not rebuilt, the area may face future reliability issues as well as safety risks resulting from the asset conditions of the Lines. The Project is needed to address the asset condition issues of the current lines.

The Company proposes the following investments to address the asset condition issues identified:

- Rebuild the existing F184N-4 and E183-3 Line between the MA/RI state line and the Warren Substation;
- Rebuild the existing F184N-5 Line between the Warren and Bristol Substations.
- Reconfigure the Warren Substation taps to shift some structures out of salt marsh and avoid crossing 115kV overhead lines west of the station.

3

Proposed Action and Project Description

3.1 Introduction

In this section of the SR, the overall scope of the Project is provided, and the individual components of the Project are described. This section of the SR also details TNEC's construction and ROW maintenance practices, safety and public health considerations, community outreach practices, estimated Project costs and the anticipated schedule for the Project.

The objectives of this Project are:

› Rebuild the F184N-4 and E183-3 Lines between the MA/RI state line and the Warren Substation;
› Rebuild the F184N-5 Line between the Warren and Bristol Substations.
› Reconfigure the Warren Substation taps to shift some structures out of salt marsh and avoid the crossing 115kV overhead lines west of the station.

The Project will reinforce the existing transmission system in Warren and Bristol. The general locations and routes of the proposed transmission system structures to be replaced are shown in Figures 1-2.

3.1.1 F184N-4/5 and E183-3 Lines Rebuild

TNEC is proposing to rebuild the existing F184N-4/5 and E183-3 Lines in the existing ROW between the MA/RI boundary in Warren, RI and the Warren Substation at 34 Norbert Steet, Warren and rebuild the existing F184N-5 Line between the Warren Substation and Bristol Substation at 99 Gooding Avenue in Bristol, RI, a distance of approximately 5.2 miles (the F184N-4/5 and E183-3 Asset Condition Rebuild Project).

The Project ROW is 200 feet wide north of the Warren Substation where the F184N-4 and E183-3 Lines occupy the same ROW. The Project ROW is 150 feet wide between the Warren and Bristol Substations and contains the F184N-5 Transmission Line and the 2295 13kV distribution line is also in the section of this ROW between the Warren Substation and Franklin Street in Warren.[3] The ROW topography is generally flat, or slightly sloping, and traverses open space, suburban, commercial, and industrial areas.

Structures are predominantly either single circuit wood H-frame structures or wood monopoles. Other less common structures include wood 2-pole structures, wood 3-pole structures, wood 5-pole structures, and steel H-frame structures. The existing F184N-4 conductor is 1113 ACSR (Aluminum Conductor Steel Reinforced) and the existing shield wire is 3/8 inch High Strength Steel. The existing F184N-5 conductor is 636 AAC (All Aluminum Conductor) and 2/0 CU and the existing shieldwire is 3/8 inch High Strength Steel. The existing E183-3 conductor is 1113 AAC and 3/8 inch High Strength Steel. The 2295 Line, a 13 kV distribution circuit is located generally on the southern/western side of the ROW, from the Warren Substation to Franklin Street in Warren.

A total of 105 structures ranging in height between 45 and 65 feet will be removed and replaced with a total of 105 new single circuit galvanized steel structures ranging in height between 61 and 107 feet. All replacement structures will be single pole, single circuit, steel poles either directly embedded or on concrete caisson foundations with davit arms in a delta configuration. Figure 31, 3-2, and 3-3 provide cross sections of the typical single circuit structures.

The conductor and shieldwire will be replaced for the entire length of both lines (1.9 miles for the E183-3 Line and 5.2 miles for the F184N-4/5 Line). The overall length of the Lines will not change significantly as a result of the Project. The existing conductors will be replaced with new single 1113 kcmil ACSS (Aluminum Conductor Steel Supported) “Finch”. The existing shield wire will be replaced with dual Optical Ground Wire (OPGW) from the MA/RI state border to the Warren Substation for the E183-3 and F184N-4 Lines. Similarly, the F184N-5 Line Bristol tap will receive dual OPGW along the entire length of the tap. All new insulators and hardware will be used.

3.2 Overhead Transmission Line Construction Practices

The rebuilding of the existing F184N-4/5 and E183-3 Lines will be accomplished using conventional overhead electric power line construction techniques. Typical construction work hours for the Project will be 7:00 a.m. to 7:00 p.m. Monday through Saturday when daylight permits. Some exceptions to these standard hours are described below. Some work tasks, such as work in tidal wetland areas susceptible to above normal high tides, concrete pours, and transmission line stringing, once started, must be continued through to completion and may go beyond normal work hours.

In addition, the nature of transmission line construction requires line outages for certain procedures such as transmission line connections, equipment cutovers, or stringing under or over other transmission lines. These outages are dictated by the system operator, ISO-NE, and can be very limited based on regional system load and weather conditions. Work requiring scheduled outages and crossings of certain transportation and utility corridors may need to be performed on a limited basis outside of normal work hours, including Sundays and holidays.

The proposed rebuild will be carried out in a sequence of activities that will normally proceed as described below.

3 The Project does not include modifications to the existing 2295 13kV distribution line.

- ROW vegetation maintenance/mowing and selective tree trimming.
- Installation of BMPs.
- Access road maintenance.
- Installation of foundations and replacement of structures.
- Conductor, Shieldwire, and OPGW replacement and installations.
- Restoration of the ROW.

The work within the ROW is not continuous and will occur in phases during the construction period. Each of these transmission line activities, in addition to environmental compliance and monitoring and construction traffic, are described in the following sections.

3.2.1 ROW Vegetation Maintenance/Mowing and Selective Tree Trimming

To facilitate construction equipment access along the majority of the ROW and at structure sites, vegetation mowing and selective tree trimming may be required in certain areas. This will be done to provide access to structure locations to facilitate safe equipment passage and structure and wire installation, to provide safe work sites for personnel within the ROW, and to maintain safe and reliable clearances between vegetation and transmission line conductors.

Element occurrence records for State-Listed rare, threatened, and endangered (RTE) species are present in portions of the ROW where work is proposed. A survey for RTE species will be conducted prior to vegetation maintenance activities in those areas. Identified individuals/populations will be delineated with polyvinyl flagging. Vegetation maintenance will not be conducted in the vicinity of identified RTE species to the greatest extent possible or will be completed by hand to avoid unintentional damage.

Wetland flagging will be refreshed as needed following vegetation maintenance.

3.2.2 Installation of Best Management Practices

Following ROW mowing and vegetation maintenance activities, appropriate erosion control devices such as compost filter sock (CFS) will be installed using the procedures identified in the Rhode Island Soil Erosion and Sediment Control Handbook, and in accordance with approved plans and permit requirements. The installation of these erosion control devices will be supervised by an environmental monitor. The devices will function to mitigate construction-related soil erosion and sedimentation, and will also serve as a physical boundary to separate construction activities from resource areas.

Access across wetland areas and streams, where upland access is not available, and work at structures within wetlands will be accomplished by the temporary placement of construction mats. Construction mats consist of timbers which are bolted together and temporarily placed over wetland areas to distribute equipment loads and minimize disturbance to the wetland and soil substrates. Construction mats will be installed in a manner so as to not impede water flow. Such temporary construction mat access roads and work pads will be removed following completion of construction, and any exposed soils will be seeded and mulched to promote vegetative growth and soil stabilization, if needed. Vegetation will not be permanently affected by the installation of these mats.

The temporary placement of upland construction mats will occur in portions of the ROW that support sensitive upland uses to minimize soil disturbance. These areas have or currently support rare, threatened, and endangered species and agriculture, are utilized as open space recreation, or maintained residential lawn. Upland construction mat access roads and work pads will be removed following completion of construction, and any exposed soils will be seeded and mulched. Vegetation will not be permanently affected by the installation of these mats.

All work is to be in conformance with Rhode Island Energy Environmental Guidance document EG-303NE, ROW Access, Maintenance and Construction Best Management Practices (EP No. 3 – Natural Resource Protection (Chapter 6), dated February 8, 2022).

3.2.3 Access Road Maintenance

Access roads are required along the ROW to provide the ability to construct, inspect, and maintain the transmission facilities. For the Project, existing access roads must be upgraded in order to support the proposed construction activities.

Access across wetland areas and streams, where upland access is not available, will be accomplished by the temporary placement of construction mats and/or construction mat bridges as described in Section 3.2.2.

In unregulated upland areas, access roads will be surfaced with crushed stone to accommodate the heavy vehicles needed to complete construction. Following the completion of construction, the access roads will be surfaced with two inches of topsoil, seeded with a native conservation mix, and mulched with straw.

Any access road maintenance will be carried out in compliance with the conditions and approvals of the appropriate federal, state and local regulatory agencies. Exposed soils on access roads will be wetted and stabilized as necessary to suppress dust generation. Crushed stone aprons (stabilized construction exits) will be used at all access road entrances at public roadways to minimize the amount of soil tracked onto paved roads by construction equipment. If necessary, public roads will be swept to remove any accumulation of Project-related soil.

Equipment typically used during the maintenance of access roads will include dump trucks used to transport fill materials to work sites, and bulldozers, excavators, backhoes and graders which will be used to place fill materials or make cuts to achieve the proper access road profile. Cranes or log trucks will be used to place construction mats in locations where temporary access across wetland areas is proposed. Throughout the Project, pick-up trucks will be used to transport crews and handheld equipment to work sites. Low-bed trailers will be used to transport tracked equipment which cannot be operated on public roadways to the work site.

3.2.4 Installation of Foundations and Replacement of Structures

As noted in the Project Description (Section 3.1.1), 105 single circuit steel transmission structures will be installed to replace the existing 104 structures. Replacement structures will be installed in close proximity to the location of the existing structures. The process for replacing structures and installing new foundations are discussed in this section.

Excavation will be required to install directly embedded replacement structures and concrete caisson foundations for new structures. Grading in uplands may be required at some structure locations to provide a level work surface for construction equipment and crews.

If rock is encountered during excavation, rock removal can generally be accomplished by means of rock drilling or hammering.

New steel monopole structures will be directly embedded or installed on concrete foundations. Directly embedded structures will be range from approximately 10 to 20 feet in depth with a diameter of 5 feet and surface area of 19.6 SF. Concrete caisson foundations will be installed for new corner structures and for some structures in wetland. These foundations will have diameters of 7, 8 or 10 feet, and range from approximately 10 to 50 feet in depth. The surface area of each foundation size are as follows: 7′ diameter: 38.5 SF; 8′ diameter: 50.25 SF; 10′ diameter: 78.5 SF. Installation of foundations will include foundation excavation, anchor bolt and rebar installation and concrete placement. Steel casings may be used to support the sides of the excavations. Following the completion of foundation construction, excavated soil, clean gravel, grout, or concrete will be used to backfill around the foundation. The steel pole structures will then be erected on the foundations. Any remaining excavated materials will be spread over upland areas and stabilized or removed from the site. Existing poles will be removed from the Project site and disposed of appropriately.

Dewatering may be necessary during excavations for structure foundations. The dewatering pumpate will be discharged into a straw bale and geotextile fabric settling basin or dewatering filter bag which will be located in an upland area. The pump intake will not be allowed to rest on the bottom of the excavation throughout dewatering. The basin and all accumulated sediment will be removed following dewatering operations, and the area will be seeded and mulched.

3.2.5 Conductor and Shield Wire Replacement and OPGW Installation

The existing conductors and/or pulling rope will be used to pull in the new conductor. The existing shieldwire and/or pulling rope will be used to pull in the new OPGW and the new shieldwire. The new conductors will be installed using stringing blocks and tensioning equipment. The tensioning equipment is used to pull the conductors through the stringing blocks and to achieve the desired sag and tension condition. During the stringing operation, temporary guard structures or boom trucks will be placed at road and highway crossings, and at crossings of existing utility lines to ensure the public safety and the continued operation of other utility equipment. To minimize any disturbance to soils and vegetation, existing access roads will be used to the fullest extent possible in the placement of pulling and tensioning equipment. In some locations, temporary construction mat pulling pads may need to be constructed.

The equipment that will typically be used during the wire installation operation includes puller-tensioners and conductor reel stands that will be located at the stringing sites. Bucket trucks and platform cranes will be used to mount stringing blocks on the structures. Pickup trucks will be used to transport work crews and small materials to work sites.

3.2.6 Restoration of the ROW

Restoration efforts, including final grading and installation of permanent erosion control devices, will be completed following the reconductoring operation. All construction debris will be removed from the Project site and properly disposed. All disturbed areas around structures and other graded locations will be seeded with an appropriate conservation seed mixture and/or mulched to stabilize the soils in accordance with applicable regulations. Temporary erosion control devices will be removed following the stabilization of disturbed areas. Pre-existing drainage patterns, ditches, roads, walls, and fences will generally be restored to their former condition. Where authorized by property owners, permanent gates and access roadblocks will be installed at key locations to inhibit access onto the ROW by unauthorized persons or vehicles.

3.2.7 Environmental Compliance and Monitoring

Throughout the entire construction process, the services of an environmental monitor will be retained. The primary responsibility of the monitor will be to confirm compliance with federal, state, and local environmental permit requirements and TNEC company policies. At regular intervals and during periods of prolonged precipitation, the monitor will inspect all locations to determine that the environmental controls are functioning properly and to make recommendations for correction or maintenance, as necessary. In addition to retaining the services of an environmental monitor, the construction contractor will be required to designate an individual to be responsible for the daily inspection and upkeep of environmental controls. This person will also be responsible for providing direction to the other members of the construction crew regarding matters such as wetland access and appropriate work methods. Installation and repair of BMPs and other compliance issues are tracked on an inspection form or action log that is updated and distributed weekly to appropriate personnel. Additionally, all construction personnel will be briefed on Project environmental issues, necessary BMPs, and permit conditions, if any, prior to the start of construction. Regular construction progress meetings will reinforce the contractor's awareness of these issues.

3.2.8 Construction Traffic

Construction-related traffic will occur over the proposed 24-month construction period. Access to the ROW for construction equipment will typically be gained from public roadways crossing the ROW in various locations along the route. Because each of the construction tasks will occur at different times and locations over the course of the construction, traffic will be intermittent at these entry roadways. Traffic will consist of various vehicle types ranging from pick-up trucks to heavy construction equipment.

TNEC will coordinate with appropriate authorities for work on public streets and roads. At locations where construction equipment must be staged in a public way, the contractor will follow a pre-approved work zone traffic control plan.

3.2.9 ROW Maintenance

As is the present case, vegetation along the ROW will continue to be managed to provide clearance between vegetation and electrical conductors and supporting structures so that safe, reliable delivery of power to consumers is assured, and to provide access for necessary inspection, repair, and maintenance of the facility. All vegetation maintenance is carried out in strict accordance with TNEC's ROW Vegetation Management Policies and Procedures, the requirements of the RIDEM Division of Agriculture and federal regulations as administered by the Environmental Protection Agency.

As is currently the case, vegetation maintenance of the ROW will be accomplished and by hand or mechanical cutting.

TNEC currently utilizes a four- to five-year vegetation maintenance cycle on its transmission ROW. TNEC's ROW vegetation maintenance practices encourage the growth of low-growing shrubs and other vegetation which provides a degree of natural vegetation control. Vegetation maintenance of the ROW under and adjacent to the transmission lines will be accomplished with methods identical to those currently used in maintaining vegetation along the existing ROW.

3.3 Safety and Public Health Considerations

TNEC will design, build, and maintain the facilities for the proposed Project so that the health and safety of the public are protected. This will be accomplished through adherence to applicable federal, state, and local regulations, and industry standards and guidelines established for protection of the public. Specifically, the proposed Project will be designed, built, and maintained in accordance with the NESC.

The facilities will be designed in accordance with sound engineering practices using established design codes and guides published by, among others, the Institute of Electrical and Electronic Engineers (IEEE), the American Society of Civil Engineers (ASCE), the American Concrete Institute (ACI), and the ANSI.

Practices which will be used to protect the public during construction will include, but not be limited to, establishing traffic control plans for construction traffic on local streets to maintain safe driving conditions, restricting public access to potentially hazardous work areas, and use of temporary guard structures at road and electric line crossings to prevent accidental contact with the conductor during installation.

A discussion of the current status of the health research relevant to exposure to EMF is attached as Appendix A. This report was prepared by Exponent, Inc.

3.3.1 RIDEM LRSMM Listed Project Area Properties

The Warren Substation parcel and Jamiel's Park off Market Street in Warren are RIDEM Office of Land Revitalization and Sustainable Materials Management (LRSMM) listed properties within the Project work areas. The Warren Substation parcel is identified as RIDEM Site Remediation File No. SR-34-0951 and investigations are ongoing in coordination with RIDEM's Site Remediation Program. Jamiel's Park is situated on a former landfill and is identified as RIDEM Site Remediation File No. SR-34-0668 A/B. Jamiel's Park is associated with a Remedial Action Work Plan (RAWP) approved by the RIDEM Solid Waste Program. Foundation installations and soil management at the Warren Substation and Jamiel's Park will be conducted in coordination with the RIDEM Solid Waste and Site Remediation Programs and applicable work plans and approvals.

3.4 Project Community Outreach

The Company believes in, and has committed to, a fully open, transparent, and regular two-way dialogue with project stakeholders throughout the life of its projects. The Company will launch – and has already undertaken efforts in this regard – a comprehensive stakeholder outreach campaign to educate and inform neighborhood residents, municipal officials, and businesses about the full scope of work to be undertaken to support this Project. Pre-construction outreach activity has included notifications to abutters and conversations with Project stakeholders regarding a variety of topics including grants of access, environmental matting needs, proposed structure locations, vegetation management, etc. The company hosted a pre-construction

Community Information Session for the public to attend and ask questions of our project team. The Company remains committed to maintaining those conversations throughout the Project.

Public outreach will also include, but is not necessarily limited to:

- Meeting with municipalities and relevant governmental organizations with interest in the Project
- Site visits with property and business owners
- Open Houses
- Community outreach (e.g., door-to-door)
- Regular Project communications (direct mail)
- A Project hotline and email
- Fact sheets, door hangers, FAQs, timelines, etc.
- Communicating Project milestones and impacts, as needed

The team will continue to maintain a high level of outreach to discuss the Project, receive comments, and answer questions throughout the permitting and construction phases.

3.4.1 Open Houses

The Project team held a Project Open House on November 13, 2024 at Kickemuit Middle School, located near the middle of the project route. This Open House provided attendees with an opportunity to interact with subject matter experts on the Project need, locations, benefits, and construction activities, and to ask questions about the Project. None of the 276 abutters notified via postcard three weeks in advance attended.

3.4.2 State and Local Meetings

The Project team has met, and will continue to meet as needed, with all relevant governmental bodies with interest in, or impacted by, the Project scope. In advance of the filing, the Project team will meet with Town representatives of Bristol and Warren, Rhode Island to outline the Project need, benefits and high-level details around the Project route, local impacts, and tentative Project schedule. In addition, the Project team has briefed RIDOT and relevant state agencies. The Project team will continue to meet regularly with governmental stakeholders throughout the Project schedule to ensure a timely flow of information and provide opportunities for input.

3.4.3 Project Hotline

A local phone number (401-400-5800) has been established for all Project-related Stakeholder inquiries. The Hotline number will be listed in all Project outreach materials, including fact sheets, mailings, the website, and signage at community events. A Project representative will staff the hotline and the Company pledges to respond within two business days to all inquiries – most often on the same day whenever practical.

3.4.4 Abutter Communications

The Company representatives have met, and will continue to meet, individually with Project abutters who have questions specific to their properties throughout the life of the Project. In addition, the Project team will be sending letters via U.S. Mail to keep them abreast of Project developments throughout the Project schedule.

3.4.5 Door-to-Door Outreach

The Company will engage in a select door-to-door outreach campaign, canvassing residents and businesses adjacent to Project activities. The purpose of this outreach is to provide information and answers to questions. If a resident is not available, a Company representative will leave Project-related information at the door. A similar effort will be undertaken with affected businesses and facilities along the Project route. The Company has met with the golf courses, farms and school along the Project route and remain in open dialogue.

3.4.6 Construction Communication Plan

Building off the existing outreach and communications plan, the Company will develop a comprehensive construction communication plan to update residents, businesses, fire, police, emergency personnel, and municipal officials on work schedules, work locations, and construction activities. In addition to the hotline, and email, this plan will include, as needed, work area signage, construction notifications, and direct contact with Project abutters.

The Company's Project representatives will be responsible for coordinating outreach during construction and serving as a single point of contact for the public. Project information also will be communicated through various town and businesses websites as permitted.

3.4.7 Communications

The Company will, in addition to the efforts outlined in the sections above, communicate/post important Project information to augment and support these communications efforts. For this project, communications will be placed in community newspapers and other publications, when necessary, to ensure maximum visibility in the community.

3.4.8 Project Materials

The Company will also produce Project materials – fact sheets, frequently asked questions and other background materials for dissemination to affected Project abutters and elected officials.

3.5 Project Costs

3.5.1 Projected Operation and Maintenance Costs

Annual operation and maintenance activities for transmission lines typically include periodic ROW vegetation management, helicopter patrol, and miscellaneous route inspections. Because the Project involves the rebuild of existing lines, any increase in operation and maintenance costs should be negligible.

3.5.2 Estimated Project Costs

TNEC prepared study grade estimates of the costs associated with the proposed Project. Study grade estimates are prepared prior to the development of detailed engineering plans using historical cost data, data from similar projects, and other stated assumptions of the Project engineer. The accuracy of study grade estimates is expected to be +50/-25 percent. Estimated costs in 2024 dollars include costs of materials, labor and equipment, and Allowance for Funds Used During Construction (AFUDC). The estimated costs of the proposed Project are presented in Table 3-1.

Table 3-1 - Estimated Project Costs (Millions)

Project Components	Estimated Cost
E183-3 Line Reconstruction	$8.04
F184N-4 Reconstruction	$8.03
F184N-5 Reconstruction	$13.08
Total Estimated Project Cost	**$29.15**

3.6 Project Schedule

It is necessary to take the transmission lines out of service while they are being rebuilt. TNEC anticipates starting construction in quarter four of 2025 with completion, including restoration of the ROW, by quarter three of 2026. The Lines are anticipated to be back in-service by quarter two of 2026. This preliminary schedule is based on time duration estimates of Project permitting and licensing, detailed engineering, materials acquisition, and construction.

A geotechnical investigation to support the design of the Project was completed in February 2025.

4

Alternatives to the Proposed Action

4.1 Introduction

The Company's foremost concern in developing the Project was to ensure that the plan selected to meet Warren and Bristol's electrical needs is the most appropriate in terms of cost and reliability, and that environmental impacts are minimized to the fullest extent possible. Alternatives to the Project have been evaluated to ensure that these objectives are met.

This section describes the alternatives that were considered to address the asset health conditions and the need to rebuild the F184N-4/5 and E183-3 Lines in Warren and Bristol. As described in section 2.0, the Project is needed to improve reliability.

Initially, three "planning alternatives" were evaluated including the following:

1. Continued Maintenance alternative
2. Structure replacement alternative
3. Transmission line rebuild

These alternatives are described in Section 4.2, which concludes that the transmission line rebuild alternative best meets system needs while minimizing cost and social and environmental impacts. Section 4.3 evaluates routing and configuration alternatives for the F184N-4/5 and E183-3 Rebuild Project, including reuse of the existing ROW.

4.2 Planning Alternatives

4.2.1 Continued Maintenance Alternative

This alternative evaluates TNEC continuing to maintain the existing assets along the Warren and Bristol Tap lines until the various components reach the average expected useful life or fail, after which they will be replaced. This option would require recurring visits to the ROW, significantly impacting the natural and social environment as crews and equipment will need to mobilize numerous times. Continuing to return to the same corridor would significantly increase the cost of the project as it is not a financially prudent option.

The cost of this option was evaluated and the 45- and 75-year costs for this option were $82.5 M and $103.3 M, respectively. When compared to the proposed project, this option is higher in cost for both the 45- and 75-year calculations.

The Continued Maintenance Alternative would leave the Warren Tap and Bristol Tap lines in a compromised condition and vulnerable to accelerated degradation, both of which could have substantial impact on reliability of service and more importantly, safety of the public and Company representatives. Waiting to replace the assets until they have reached average expected useful life also results in higher maintenance costs to prevent premature failures. Additionally, with this option, existing structure framing would remain the same and clearances would not be improved.

In summary, this alternative was dismissed as it would not address the Project needs and maintain reliable service to customers, while also being more costly than the proposed project.

4.2.2 Structure Replacement Alternative

The structure replacement alternative evaluated an upfront replacement of all existing wood structures along the Lines. Typically, in a structure replacement alternative, the existing conductor and shield wire would remain until they reached the end of their average expected useful life, at which point they will be replaced. However, the existing conductor along the Lines has already reached the end of its average expected useful life and therefore would be replaced upfront too. Due to the age of the conductor, this alternative was not further evaluated as the scope overlaps with the Transmission Line Rebuild Alternative (see 4.2.3).

4.2.3 Transmission Line Rebuild Alternative (Project) (Preferred)

The Company concluded that the proposed Project is the preferred alternative to meet the identified need. The proposed Project includes structure replacements along approximately 1.9 miles of the F184N-4 and E183-3 Warren Taps, and 3.3 miles of the F184N-5 Bristol Tap. The existing conductor on all Tap Lines will be replaced (reconductored) with new single 1113 kcmil ACSS conductor. The existing shield wire will be replaced with dual OPGW from the MA/RI state border to Warren substation for F184N-4 and E183-3. Similarly, the F184N-5 Bristol Tap will receive dual OPGW along the entire length of the tap. The Company will be maintaining and upgrading access roads, signage and grounding along the full length of the Project, as applicable. This option is the only alternative that resolves all of the condition and reliability issues with the existing Warren and Bristol Tap Lines.

The cost of this option was evaluated and the 45- and 75-year costs for this option were $70.3 M and $85.0 M, respectively.

The proposed Project was determined to be the most economical solution that met the identified need.

4.2.4 Conclusion on Planning Alternatives

For the reasons summarized in the previous sections, TNEC concluded that the Transmission Line Rebuild Alternative is preferable to the Continued Maintenance Alternative and the Structure Replacement Alternative.

The Continued Maintenance Alternative and Structure Replacement Alternative were dismissed because they would not address all of the reliability and asset condition issues identified in Section 2, and therefore are not an acceptable means of maintaining a firm and reliable electric supply in Warren and Bristol.

Because the Transmission Line Rebuild Alternative provides a longer-term solution to the needs identified in Section 2 with comparable environmental impacts and is more financially prudent than the other Alternatives, TNEC determined to pursue this Alternative.

4.3 Alternatives for the F184N-4/5 and E183-3 Lines

4.3.1 Reuse Existing ROW (Proposed)

As discussed in more detail in Section 3, TNEC proposes to replace existing utility structures on the F184N-4/5 and E183-3 Lines overhead within the existing ROW between the MA/RI boundary in Warren and the Bristol Substations.

4.3.2 Underground Transmission Lines Alternative

TNEC also examined a potential underground alternative for the proposed Project. Although an underground alternative could address the quality and reliability of electric supply as discussed in Section 2.0, an underground alternative would incur significant cost, schedule, and operational disadvantages. TNEC evaluated use of the existing ROW for a potential underground alternative for the Project. There are five stream crossings and extensive wetland areas along the ROW, and there would be 11 crossings under state and municipal roads. These features can be easily spanned by overhead transmission lines, but special construction techniques, such as horizontal directional drilling or pipe-jacking, would be needed to cross these obstacles with an underground route. Environmental impacts would be substantially increased, as construction of the underground lines would require development of additional access roads and excavation along the full 5.2-mile Project ROW. A new underground alternative would also take several years to design, license and build, increasing the risk of structure failure and line outages in the interim.

Underground lines also present system and operational disadvantages versus overhead transmission lines. When an overhead transmission line experiences an outage, it can typically be repaired within 24 to 48 hours. In the case of a failure of an underground transmission cable, repair times can be in the range of two weeks to a month or more. Additionally, many faults on overhead lines are temporary in nature. Often it is possible to re-energize an overhead line after a temporary fault and return the line to service with only a brief interruption. Faults on underground transmission cables are almost never temporary, and the cable must remain out of service until the problem is diagnosed and repairs can be completed.

To underground a transmission line, there is a cost of roughly $17.5M per mile. The total cost for undergrounding this project would be $124.25M. Because of the high cost, extensive engineering, and environmental impacts, the underground option was not considered.

4.3.3 Conclusion

For the reasons summarized in the previous sections, TNEC concluded that refurbishing the F184N-4/5 and E183-3 Lines on the existing ROW is strongly preferred to constructing the lines underground.

4.4 Conclusion

TNEC has evaluated multiple alternative to address electric reliability and asset condition needs in Warren and Bristol, including a Continued Maintenance Alternative, a Transmission Line Rebuild Alternative, and a Wooden Structure Replacement Alternative. Based on the analysis above, TNEC has determined the refurbishment of structures on the F184N-4/5 and E183-3 Lines within the existing ROW is the preferred approach. Construction of the Project as proposed will allow TNEC to continue to provide reliable electric service to its Warren and Bristol customers at reasonable cost and with minimal environmental impacts.

5

Description of Affected Natural Environment

This section of the SR describes the existing natural environment that may be affected by the proposed Project, both within and surrounding the existing transmission line ROW and substation sites. As required by the Rules and Regulations of the EFSB, this section includes a detailed description of all environmental characteristics within and immediately surrounding the proposed Project. The following section describes the specific natural features which have been assessed to evaluate impacts and prepare a mitigation plan. Information pertaining to existing site conditions has been obtained through available published resource information, the Rhode Island Geographic Information System (RIGIS) database, various state and local agencies, and field investigations of the Project ROW.

5.1 Project Study Area

A Project Study Area was established to accurately assess the existing environment within and immediately surrounding the Project ROW. The Study Area consists of a half-mile wide corridor centered on the existing Project ROW that extends from the Massachusetts/Rhode Island Boundary in Warren to the Bristol Substation at 99 Gooding Avenue in Bristol (refer to Figure 5-1). The boundaries of this corridor were determined to allow for a detailed inventory of existing conditions within and adjacent to the Project ROW.

5.2 Climate and Weather

Rhode Island has a moist continental climate with four distinct seasons (Rhode Island Secretary of State, n.d.). Its weather is tempered by sea winds, particularly in the Seaboard Lowland, which has a more moderate climate than the rest of New England. Temperatures in Rhode Island tend to fluctuate by large ranges both daily and annually (National Climatic Data Center, 2011). The mean annual temperature of Rhode Island's coastal areas, such as Warren and Bristol, is 51 degrees Fahrenheit, with an average minimum temperature of 25 degrees Fahrenheit and an average maximum temperature of approximately 70 degrees Fahrenheit (National Climatic Data Center, 2011). Rhode Island is characterized by an even distribution of precipitation throughout the year with an annual average of 42 to 46 inches over most of the state, with approximately 20 inches of that total attributed to snowfall in the coastal Narragansett Bay regions (National

Climatic Data Center, 2011). Due to its proximity to the belt of generally eastward air movement which interacts to produce storm systems, Rhode Island experiences a considerable diversity of weather over the short term and long-term scale (National Climatic Data Center, 2011).

Although Rhode Island experiences a diversity of weather, the effects of climate change in the state are measurable. According to the 2015 Rhode Island Department of Health Climate Change Program Climate Change and Health Resiliency Report , the average air temperature in Rhode Island has increased by 2 degrees Fahrenheit from 1985 to 2014 and the temperature in Narragansett Bay has risen by 4 degrees Fahrenheit at the surface during winter months since the 1960s. Climate change has also resulted in a higher frequency of rainfall events that lead to flooding and longer periods of hot, dry weather that strain the state's water resources. These climate effects have begun to impact the local economy; farmers experience less predictable rainfall which translates to uncertain crop yields while the fishing industry has been forced to adapt to a change in fish species composition from cold-water, bottom-dwelling species to warm-water, water-column species. Rhode Island will experience warmer temperatures, more extreme weather events such as intense precipitation and flooding, and sea level rise (Rhode Island Climate Change Commission, 2012).

5.3 Geology

5.3.1 Bedrock Geology

The Study Area is within the Seaboard Lowland section of the New England physiographic province. The Study Area primarily consists of topography and bedrock associated with the Narragansett Bay Group – Rhode Island Formation (Pennsylvanian Age). This area consists of meta-sandstone, meta-conglomerate, schist, carbonaceous schist, and graphite (Hermes et al., 1994). This formation is part of the Esmond-Dedham Subterrane Narragansett Bay Group - deposited upon older rocks of both West Bay and East Bay parts of the Esmond-Dedham subterrane (Hermes et al. 1994).

The primary rock type in this area is arenite, a "clean" sandstone that is well-sorted, contains little or no matrix material, and has a relatively simple mineralogic composition; specifically a pure or nearly pure, chemically cemented sandstone containing less than 10 percent argillaceous matrix (Hermes et al. 1994).

In Bristol and a portion of the study area in Warren, an additional bedrock type of mica schist (Late Proterozoic Age or older) is present. This area consists of gray to green, fine-grained, thinly bedded schist consisting of muscovite, biotite, chlorite, and quartz (Hermes et al. 1994). This formation is deposited upon older rocks of East Bay parts of the Esmond-Dedham subterrane (Hermes et al. 1994).

5.3.2 Surficial Geology

The present landscape of Warren and Bristol, as with much of the northeastern United States, was shaped by the repeated advance and retreat of glaciers since the Pleistocene epoch between 2.5 and 3 million years ago (Raposa and Schwartz, 2009). The last glacial period to affect the Study Area was the Wisconsin ice sheet, approximately 10,000 to 12,000 years ago (Raposa and Schwartz, 2009). The surficial geology in the study area is generally derived from two depositional processes, one associated with the action of the advancing ice sheet overriding the landscape and the other by materials washed out in front of the retreating glacier by meltwaters.

Glacial till deposits were formed as the glacial front advanced and overrode the landscape. This process would reshape the landform, grinding down hills and depositing material in valleys creating the streamlined elongate hills with axes oriented along the direction of glacier travel known as "drumlins". The southern portion of the Study Area is generally centered along the axis of a drumlin. The material deposited by this process is classified as glacial till and consists of a mix of separates sized from boulders and stones down to sand, silt and clay. There are two forms of glacial till in the Study Area: lodgement till and ablation till. Lodgement till was deposited directly under the glacier as it advanced and ablation till was deposited from material atop and within the ice as it melted. Lodgement till is the dominant surficial deposit in the Study Area and is characterized by a dense, slowly permeable layer two or three feet below the ground surface locally known as "hardpan". This hardpan is absent in ablation till or occurs at greater depth that does not affect internal drainage.

Glacial outwash or glaciofluvial deposits consist of materials that were sorted and deposited by the abundant meltwater which flowed from the wasting glacier front. This material is typically composed of rounded stones and contains gravels and sands deposited in recognizable layers by glacial meltwater. Silt and clay sized separates were generally washed out of these materials and carried away in the meltwater streams.

The boundary between areas of till and outwash deposits is often characterized by an abrupt change in slope. Both glacial till and outwash deposits may be capped by windblown deposits of silt, known as loess.

Small areas of alluvial and organic deposits are also found with the Study Area. Alluvial soils are formed by Holocene stream sediments. Organic deposits occupy portions of larger wetland systems. The surficial geologic materials in the Study Area are depicted in Figure 5-2.

5.3.3 Geological Hazards

Geological hazards, such as earthquakes or fault zones, could have negative impacts on transmission lines or substations. Rhode Island is in a region of the North American plate and falls within seismic zone 2A with 10-14 percent ground acceleration, which translates to a "moderate" seismic hazard (Petersen et al. 2008; US Seismic Zone Map). This means that people may experience moderate intensity shaking that can lead to slight damage during an earthquake event (Federal Emergency Management Agency (FEMA)) Earthquake Hazard maps). There are no significant geologic fault lines in Rhode Island or New England, and the U.S. Geological Survey (USGS) Earthquake Hazards Program identifies all of Rhode Island as occurring in a low seismic risk area (<2 percent peak ground acceleration). Earthquakes that occur in the northeast, which is considered an intraplate area, do not meet the assumptions of the plate tectonic theory since there is no obvious relationship between earthquake occurrence and fault lines in intraplate areas (Kafka, 2014 rev. 2020).

A commonly accepted explanation for the occurrence of earthquakes in the northeast is that "ancient zones of weakness" are being reactivated by the present stress field (Kafka, 2014 rev. 2020). This theory hypothesizes that pre-existing faults and other geologic features formed during ancient geological episodes persist today and that earthquakes occur when present-day stress is released along these zones of weakness (Kafka, 2014 rev. 2020). Earthquakes occur infrequently in Rhode Island and surrounding New England and therefore present a minimal risk for the design life of the Project.

5.3.4 Sand and Gravel Mining

There are no quarries or regulated facilities in the Study Area, likely due to the unsuitable surficial geology of the area.

5.4 Soils

Detailed information concerning the physical properties, classification, agricultural suitability, and erodibility of soils in the vicinity of the Study Area are presented in this section. Descriptions of soil types identified within the Study Area were obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey[4], the Soil Survey of Rhode Island (Rector, 1981), and from on-site investigations conducted by VHB. The Soil Survey delineates map units that may consist of one or more soil series and/or miscellaneous non-soil areas that are closely and continuously associated on the landscape. In addition to the named series, map units include specific phase information that describes the texture and stoniness of the soil surface and the slope class. A total of 33 named soil series have been mapped within the Study Area. Table 5-1 lists the characteristics of the 53 soil phases (lower taxonomic units than series) found within the Study Area. Figure 5-3 depicts soil classes grouped by erodibility hazard and hydric soil presence.

Table 5-1 - Soil Phases within Study Area

Soil Map Unit Symbol	Soil Phase	Acres	Drainage Class	Percent Slope
AfA	Agawam fine sandy loam	31.3	Wd	0 to 3
AfB	Agawam fine sandy loam	0.5	Wd	3 to 8
Ba	Beaches, sand	3.5	NA	0 to 8
Bc	Birchwood sandy loam	21.2	mwd	0 to 3
BiB	Bigapple sand	3.9	wd	0 to 8
BrB	Broadbrook silt loam	6.7	Wd	3 to 8
CaC	Canton and Charlton rock outcrop complex	2.0	Wd	3 to 15
CB	Canton urban land complex	29.7	Wd	0 to 15
CdA	Canton and Charlton-fine sandy loams	50.5	wd	0 to 3
CdB	Canton and Charlton fine sandy loams	73.0	Wd	3 to 8
CeC	Canton and Charlton fine sandy loams, very rocky	19.6	Wd	3 to 15

4 Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed [October 31, 2024].

Soil Map Unit Symbol	Soil Phase	Acres	Drainage Class	Percent Slope
ChB	Canton and Charlton fine sandy loams, very stony	8.2	Wd	0 to 8
Dc	Deerfield loamy fine sand	115.7	Mwd	0 to 3
Du	Dumps	4.1	NA	NA
FtA	Fortress sand	8.3	Mwd	0 to 3
HkA	Hinckley loamy sand	11.7	Ed	0 to 3
Ip	Ipswich mucky peat, very frequently flooded	29.3	Vpd	0 to 2
Ma	Mansfield mucky silt loam	10.4	vpd	0 to 3
Mk	Matunuck mucky peat, very frequently flooded	134.9	Vpd	0 to 2
MmA	Merrimac fine sandy loam	41,1	Swed	0 to 3
MmB	Merrimac fine sandy loam	0.3	Swed	3 to 8
MU	Merrimac-Urban land complex	353.5	Swed	0 to 8
NeA	Newport silt loam	49.9	wd	0 to 3
NeB	Newport silt loam	209.6	wd	3 to 8
NfB	Newport very stony silt loam	38.7	wd	3 to 8
NP	Newport urban land complex	153.7	wd	1 to 15
Nt	Ninigret fine sandy loam	31.1	Mwd	0 to 3
PaA	Paxton fine sandy loam	21.1	Wd	0 to 3
PaB	Paxton fine sandy loam	18.2	Wd	3 to 8
PbB	Paxton fine sandy loam, very stony	5.5	Wd	0 to 8
PD	Paxton-Urban land complex	45.8	Wd	3 to 15
PmA	Pittstown silt loam	146.3	mwd	0 to 3
PmB	Pittstown silt loam	128.4	mwd	3 to 8
PnB	Pittstown very stony silt loam	5.1	Mwd	0 to 8
RaA	Rainbow silt loam	10.3	Mwd	0 to 3
RaB	Rainbow silt loam	11.0	Mwd	3 to 8
Re	Ridgebury fine sandy loam	72.1	Pd	0 to 3
Rf	Ridgebury, Leicester, and Whitman soils	21	Pd	0 to 8
Sa	Sandyhook mucky fine sand	10.5	vpd	0 to 2
Sb	Scarboro mucky fine sandy loam	12.4	Vpd	0 to 3
Se	Stissing silt loam	190.2	pd	0 to 3
Sf	Stissing very stony silt loam	68.1	pd	0 to 3
Ss	Sudbury sandy loam	31.2	Mwd	0 to 3
StA	Sutton fine sandy loam	31.5	Mwd	0 to 3
StB	Sutton fine sandy loam	17.8	Mwd	3 to 8

Soil Map Unit Symbol	Soil Phase	Acres	Drainage Class	Percent Slope
SwA	Swansea muck	8.1	Vpd	0 to 2
UD	Udorthents	16	mwd to ed	0 to 15
Ur	Urban Land	11.9	mwd to ed	0 to 10
UrS	Urban Land, sandy substratum	0.3	Mwd to ed	0 to 3
Wa	Walpole sandy loam	192.6	Pd	0 to 3
WgA	Windsor loamy sand	11.8	Ed	0 to 3
WhA	Woodbridge fine sandy loam	3.7	Mwd	0 to 3
WhB	Woodbridge fine sandy loam	43.6	Mwd	3 to 8

Notes: ed – excessively drained; wd – well drained; mwd – moderately well drained; swed – somewhat excessively drained; pd – poorly drained (hydric); vpd – very poorly drained (hydric); 8-15 percent slope – highly erodible

Source: Soil Survey of Rhode Island (Rector, 1981), Soil Data Mart (USDA NRCS website: http://soildatamart.nrcs.usda.gov/Report.aspx?Survey=RI600&UseState=RI

5.4.1 Soil Series

The soil series detailed in the following subsections have been identified within the Study Area. The classification follows that published in the Soil Survey of Rhode Island (Rector, 1981).

5.4.1.1 Agawam Series

The Agawam series consists of very deep, well drained soils formed in sandy water deposited material derived mainly from schist, granite, gneiss, and phyllite. They are level to steep sloping soils on outwash plains and high stream terraces. Saturated hydraulic conductivity is moderately high to high in the upper solum and high or very high in the lower solum and substratum.

5.4.1.2 Beaches Series

The Beaches series consists sandy, gravelly, and cobbly areas of sand dunes or escarpments that are nearly level to gently sloping along the shore of the ocean.

5.4.1.3 Birchwood Series

The Birchwood series consists of very deep, moderately well drained soils formed in a mantle of sandy material overlying dense till on uplands. They are nearly level to strongly sloping soils on plains. Permeability is moderately rapid or rapid in the surface layer, rapid or very rapid in the subsoil and slow to very slow in the dense substratum.

5.4.1.4 Bigapple Series

The Bigapple soil series is classified very deep, well to excessively drained soils formed in human-transported material (HTM) from dredging activities of nearby shorelines, waterways, bays, or rivers. They are nearly level to strongly sloping soils on modified landscapes in and near urbanized areas of the Northeast. Saturated hydraulic conductivity is high or very high in the surface and very high in the subsoil and substratum.

5.4.1.5 Broadbrook Series

The Broadbrook series consists of well drained soils formed in till derived from dark gray phyllite, slate, or schist. Soils are very deep to bedrock and moderately deep to densic contact. They are nearly level to steep sloping soils on till plains, hills, and drumlins. Saturated hydraulic conductivity is moderately high or high in the mineral surface layer and subsoil and low to moderately high in the dense substratum.

5.4.1.6 Canton and Charlton Series

The Canton series is classified as coarse-loamy over sandy or sandy skeletal, mixed, mesic Typic Dystrudepts (National Cooperative Soil Survey, 2010). These well drained soils formed in glacial till derived mainly from schist and gneiss. The similar Charlton series is classified as coarse-loamy, mixed, mesic Typic Dystrudepts (National Cooperative Soil Survey, 2010). These soils were also formed in glacial till derived mainly from schist and gneiss. Charlton soils have a finer textured substratum than Canton soils. Because these series are similar they are grouped and mapped together as an association.

5.4.1.7 Canton Urban Land Complex

The Canton Urban Land Complex series is classified as areas of very deep, well drained Canton soil and areas of Urban Land that are joined on the landscape in intricate patterns. Because of this the two series are grouped and mapped together as it is not practical to map them separately at the scale used for matting.

5.4.1.8 Deerfield Series

The Deerfield series consists of very deep, moderately well drained soils formed in thick deposits of sand derived mainly from granite, gneiss, and quartzite. They are nearly level to strongly sloping soils on terraces, deltas, and outwash plains. Saturated hydraulic conductivity is high or very high.

5.4.1.9 Dump Series

Areas mapped as the Dump series are those that are currently or were historically used for trash disposal. Soils are predominantly composed of human transported material (HTM) and may have minor inclusions of Hinckley, Merrimac, Canton, Charlton, and Narragansett soils. They are most often situated on outwash terraces.

5.4.1.10 Fortress Series

The Fortress series consists of very deep, moderately well drained soils formed in a thick mantle of sandy dredge spoils from dredging activities in coastal waters and rivers. They are nearly level to strongly sloping soils in and near major urbanized areas of the Northeast. Saturated hydraulic conductivity is high or very high in the surface and very high in the subsoil and substratum.

5.4.1.11 Hinckley Series

The Hinckley series consists of very deep, excessively drained soils formed in glaciofluvial sand and gravel derived mainly from granite, gneiss and schist. They are nearly level through very steep soils on outwash terraces, outwash plains, outwash deltas, kames, kame terraces, and eskers. Saturated hydraulic conductivity is high or very high.

5.4.1.12 Ipswich Series

The Ipswich series consists of very deep, very poorly drained soils formed in partially decomposed organic material from salt tolerant herbaceous plants. They are nearly level and found in tidal marshes adjacent to the Atlantic Ocean subject to inundation by salt water twice daily. Saturated hydraulic conductivity is moderately high to very high.

5.4.1.13 Mansfield Series

The Mansfield series consists of very poorly drained loamy soils formed in dense till. These soils are moderately deep to a densic contact and very deep to bedrock. They are nearly level soils in depressions and drainageways of uplands. The soils have a water table near or above the surface most of the year. Permeability is moderately rapid or moderate in the surface layer and subsoil and slow or very slow in the substratum.

5.4.1.14 Matunuck Series

The Matunuck series consists of very deep, very poorly drained soils formed in shallow herbaceous organic material underlain by sandy marine or glaciofluvial deposits. They are level soils in tidal marshes along the Atlantic Ocean subject to tidal flooding by salt water twice daily. Saturated hydraulic conductivity is moderately high to very high in the organic layers and very high in the underlying mineral sediments.

5.4.1.15 Merrimac Series

The Merrimac series consists of very deep, somewhat excessively drained soils formed in water sorted gravelly and sandy material derived mainly from granite, gneiss, and schist. They are nearly level through very steep soils on outwash terraces and plains and other glaciofluvial landforms. Saturated hydraulic conductivity is high or very high.

5.4.1.16 Newport Series

The Newport series consists of well drained loamy soils formed in lodgement till derived mainly from dark sandstone, conglomerate, argillite, and phyllite. The soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level through moderately steep soils on till plains, low ridges, hills and drumlins. Saturated hydraulic conductivity is moderately high to high in the surface layer and subsoil, and low to moderately high in the dense substratum.

5.4.1.17 Newport-Urban land complex

The Newport-Urban land complex consists of well drained Newport soils and areas of Urban land. The complex is on drumlins and glacial till plains of densely populated areas mainly in southeastern Rhode Island.

5.4.1.18 Ninigret Series

The Ninigret series consists of very deep, moderately well drained soils formed in loam over stratified sandy and gravelly outwash derived from a variety of acidic rocks. They are nearly level to strongly sloping soils on glaciofluvial landforms, typically in slight depressions and broad drainage ways. Saturated hydraulic conductivity is moderately high to high in the solum and high to very high in the substratum.

5.4.1.19 Paxton Series

The Paxton series consists of well drained loamy soils formed in acidic lodgment till derived mainly from schist, gneiss, and granite. The soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level to steep soils on hills, drumlins, till plains, and ground moraines. Saturated hydraulic conductivity is moderately high to high in the surface layer and subsoil, and low to moderately low in the substratum.

5.4.1.20 Pittstown Series

The Pittstown series consists of moderately well drained soils formed in lodgement till derived mainly from slate, phyllite, shale, and schist. These soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level through moderately steep soils on uplands. Slope ranges from 0 through 25 percent. Saturated hydraulic conductivity is moderately high or high in the mineral solum and moderately low or moderately high in the substratum.

5.4.1.21 Rainbow Series

The Rainbow series consists of very deep to moderately deep, moderately well drained soils formed in silty mantled acid till derived mainly from gneiss, schist, sandstone, conglomerate, and basalt. They are nearly level to strongly sloping on till plains, hills, and drumlins. Saturated hydraulic conductivity is moderately high or high in the surface layer and subsoil, and low to moderately high in the dense substratum.

5.4.1.22 Ridgebury Series

The Ridgebury series consists of very deep, somewhat poorly drained soils formed in lodgment till derived mainly from granite, gneiss, and/or schist. They are commonly shallow to densic contact and are nearly level to gently sloping soils in depressions in uplands. They also occur in drainageways in uplands, in toe slope positions of hills, drumlins, and ground moraines, and in till plains. Saturated hydraulic conductivity is moderately high or high in the solum and very low in the substratum.

5.4.1.23 Sandyhook Series

The Sandyhook series consists of very deep, very poorly drained soils formed in thick sandy marine deposits with thin organic surfaces. They are nearly level to gently sloping on tidal marshes, back-barrier flats, and back-barrier beaches subject to daily tidal flooding. Saturated hydraulic conductivity is moderately high to very high in the organic layers and very high in underlying mineral sediments.

5.4.1.24 Scarboro Series

The Scarboro series consists of very deep, very poorly drained soils in sandy glaciofluvial deposits on outwash plains, deltas, and terraces. They are nearly level soils in depressions. Slope ranges from 0 through 3 percent. Saturated hydraulic conductivity is high or very high.

5.4.1.25 Stissing Series

The Stissing series consists of poorly drained soils formed in dense till derived principally from dark phyllite, slate, shale, and schist. These soils are very deep to bedrock and shallow to a densic contact. They are nearly level to strongly sloping soils on glaciated uplands. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is moderately high or high in the solum and moderately low or moderately high in the dense substratum.

5.4.1.26 Sudbury Series

The Sudbury series consists of very deep, moderately well and somewhat poorly drained soils formed in water sorted sandy and gravelly glaciofluvial materials derived mainly from granite, gneiss, and schist. They are nearly level through strongly sloping soils in slight depressions and on terraces and foot slopes in areas of outwash or glaciofluvial deposits. Saturated hydraulic conductivity is moderately high to high in the upper solum and high to very high in the lower solum and substratum.

5.4.1.27 Sutton Series

The Sutton series consists of very deep, moderately well drained loamy soils formed in melt-out till derived mainly from granite, gneiss, and schist. They are nearly level to strongly sloping soils on hills, low ridges, and ground moraines, typically on foot slopes, lower backslopes, and in slight depressions. Saturated hydraulic conductivity is moderately high to high throughout.

5.4.1.28 Swansea Series

The Swansea series consists of very poorly drained organic soils formed in highly decomposed organic material over sandy mineral. They are in depressions or level on outwash plains, till plains, and moraines. Saturated hydraulic conductivity is moderately high or high in the organic material and very high in the substratum.

5.4.1.29 Udorthents Series

Udorthents are moderately well drained to excessively drained soils that have been cut, filled, or eroded, typically by anthropogenic processes. The areas have had more than two feet of the upper part of the original soil removed or have more than two feet of fill on top of the original soil. Udorthents are extremely variable in texture. They are on glacial till plains and gravelly outwash terraces.

5.4.1.30 Urban Land

Urban land consists mostly of sites for buildings, paved roads and parking lots. The areas are mostly rectangular and range from 5 to 100 acres. Soils included in this unit are small intermingled areas of Udorthents, somewhat excessively drained Merrimac soil, well drained Canton, Charlton, and Newport soils; moderately well drained Pittstown, Sudbury and Sutton soils.

5.4.1.31 Walpole Series

The Walpole series consists of very deep, poorly drained sandy soils formed in outwash and stratified drift derived from crystalline rocks. They are nearly level to gently sloping soils in lowlying positions on terraces and plains. Saturated hydraulic conductivity is moderately high to high in the surface layer and subsoil, and high to very high in the substratum.

5.4.1.32 Windsor Series

The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits of poorly graded sands and loamy sands derived mainly from crystalline rocks. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high throughout.

5.4.1.33 Woodbridge Series

The Woodbridge series consists of moderately well drained loamy soils formed in lodgement till derived from granite, gneiss, and schist. They are very deep to bedrock and moderately deep to a densic contact. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Saturated hydraulic conductivity ranges from moderately high to high in the surface layer and subsoil, and low to moderately low in the dense substratum.

5.4.2 Prime Farmland Soils

Prime farmland, as defined by the United States Department of Agriculture (USDA), is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods.

Rhode Island recognizes 35 prime farmland soils (USDA, 2012). Prime farmland soils can be used for cropland, pastureland, rangeland, forestland, or other land. Urbanized land and water are exempt from consideration as prime farmland. The proposed Project will cross 6 prime farmland soil units as listed in Table 5-2. Within the Study Area, prime farmland soils exist on land occupied by commercial, institutional, recreational, agricultural and residential land use, cleared ROW, forestland, and roads.

Table 5-2 - USDA Prime Farmland Soils within the Study Area

Soil Map Unit Symbol	Name	Percent Slope
AfA	Agawam fine sandy loam	0 to 3
AfB	Agawam fine sandy loam	3 to 8
Bc	Birchwood sandy loam	0 to 3
BrB	Broadbrook silt loam	3 to 8
CdA	Canton and Charlton fine sandy loam	0 to 3
CdB	Canton and Charlton fine sandy loam	3 to 8
MmA	Merrimac sandy loamy	0 to 3
MmB	Merrimac sandy loam	3 to 8
NeA	Newport silt loam	0 to 3
NeB	Newport silt loam	3 to 8
Nt	Ninigret fine sandy loam	0 to 3
PaA	Paxton fine sandy loam	0 to 3

Soil Map Unit Symbol	Name	Percent Slope
PaB	Paxton fine sandy loam	3 to 8
PmA	Pittstown silt loam	0 to 3
PmB	Pittstown silt loam	3 to 8
RaA	Rainbow silt loam	0 to 3
RaB	Rainbow silt loam	3 to 8
Ss	Sudbury sandy loam	0 to 3
StA	Sutton fine sandy loam	0 to 3
StB	Sutton fine sandy loam	3 to 8
WhA	Woodbridge fine sandy loam	0 to 3
WhB	Woodbridge fine sandy loam	to 8

Source: Soil Survey of Rhode Island (Rector, 1981).

5.4.3 Farmland of Statewide Importance

Farmland of statewide importance is land that is designated by the Rhode Island Department of Administration Division of Planning to be of statewide importance for the production of food, feed, fiber, forage, and oilseed crops (USDA, 2012). Generally, farmlands of statewide importance include those lands that do not meet the requirements to be considered prime farmland, yet they economically produce high crop yields when treated and managed with modern farming methods. Some may produce as high a yield as prime farmland if conditions are favorable.

In order to extend the additional protection of state regulation to prime farmland, the State of Rhode Island has expanded its definition of farmland of statewide importance to include all prime farmland areas. Therefore, in Rhode Island, all USDA designated prime farmland soils are also farmland of statewide importance.

Table 5-3 lists soil units designated as farmland soils of statewide importance that are found within the Study Area. The Project ROW crosses a property at 326 Market Street operating as a cattle ranch.

Table 5-3 - Farmland Soils of Statewide Importance within the Study Area

Soil Map Unit Symbol	Phase	Percent Slope
Dc	Deerfield loamy fine sand	0 to 3
HkA	Hinckley gravelly sandy loam	0 to 3
Re	Ridgebury fine sandy loam	0 to 3
Se	Stissing silt loam	0 to 3
Wa	Walpole sandy loam	0 to 3
WgA	Windsor loamy sand	0 to 3

Source: Soil Survey of Rhode Island (Rector, 1981).

5.4.4 Potentially Erosive Soils

The erodibility of a soil is dependent upon the slope of the land occupied by the soil and the texture of the soil. NRCS has characterized soil map units as "highly erodible", "potentially highly erodible", or "not highly erodible" due to sheet and rill erosion (USDA, 1993). This determination is done by using the Universal Soil Loss Equation (USLE). The USLE relates the effects of rainfall, soil characteristics, and the length and steepness of slope to the soil's tolerable sheet and rill erosion rate (see Figure 5-3).

Soils are given an erodibility factor (K), which is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values in Rhode Island range from 0.10 to 0.64 and vary throughout the depth of the soil profile with changes in soil texture. Very poorly drained soils and certain floodplain soils usually occupy areas with little or no slope. Therefore, these soils are not subject to erosion under normal conditions and are not given an erodibility factor. Soil map units described as strongly sloping or rolling may include areas with slopes greater than eight percent and soil map units with moderate erosion hazard are listed in Table 5-4.

Table 5-4 - Soil Mapping Units with Potential Steep Slopes within the Study Area

Soil Map Unit Symbol	Soil Phase	Percent Slope	Erodibility Hazard	Surface K Values
AfB	Agawam fine sandy loam	3 to 8	Phel	0.28
BrB	Broadbrook silt loam	3 to 8	Phel	0.28
CaC	Canton-Charlton rock outcrop complex	3 to 15	Phel	0.2
CdB	Canton and Charlton fine sandy loams	3 to 8	Phel	0.24
CeC	Canton and Charlton-fine sandy loam, very rocky	3 to 15	Phel	0.17-0.24
ChB	Canton and Charlton fine sand loams, very stony	3 to 8	Phel	0.2
MmB	Merrimac sandy loam	3 to 8	Phel	0.24
NeB	Newport silt loam	3 to 8	Phel	0.24
NfB	Newport very stony silt loam	3 to 8	Phel	0.24
PaB	Paxton fine sandy loam	3 to 8	Phel	0.24
PbB	Paxton very stony fine sandy loam	0 to 8	Phel	0.20
PmB	Pittstown silt loam	3 to 8	Phel	0.28
PnB	Pittstown very stony silt loam	0 to 8	Phel	0.24
RaB	Rainbow silt loam	3 to 8	Phel	0.28
StB	Sutton fine sandy loam	3 to 8	Phel	0.24
WhB	Woodbridge fine sandy loam	3 to 8	Phel	0.2
WnC	Windsor loamy sand	8 to 15	Phel	0.15

Source: Soil Survey of Rhode Island (Rector, 1981) and United States Department of Agriculture, Natural Resources Conservation Service, Highly Erodible Soil Map Units of Rhode Island, Revised January 1993.

Phel Potentially Highly Erodible

5.5 Surface Water

The Study Area lies within the Narragansett Bay drainage basin of Rhode Island. A drainage basin is the area of land that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel or tidal water body (Dunne and Leopold, 1978), and is synonymous with watershed. Narragansett Bay extends approximately 45 kilometers (km) from north to south and 18 km at its widest point from west to east (Chinman and Nixon, 1985). The Narragansett Bay watershed is composed of nine sub-watersheds. Sub-watersheds within the Study Area are the Upper East Passage, Barrington River-Warren River, Palmer River, Mount Hope Bay, and the Old Mill Creek-Narragansett Bay sub-watersheds (Raposa and Schwartz, 2009). The bodies of water within these watersheds are Palmer River, four unnamed tributaries to the Palmer River, Warren River, an unnamed tributary to the Warren, River , Kickemuit Reservoir (Warren Reservoir), Kickemuit River, an unnamed tributaries to the Kickemuit River, Silver Creek, an unnamed tributary to Silver Creek, and nine unnamed lakes or pond. The Narragansett Bay Basin flows south into Rhode Island and Block Island sounds, and ultimately the Atlantic Ocean.

The waters of the State of Rhode Island (meaning all surface water and groundwater of the State) are assigned a Use Class which is defined by the most sensitive uses which it is intended to protect. Waters are classified according to specific physical, chemical, and biological criteria which establish parameters of minimum water quality necessary to support the water Use Classification. The water quality classification of the major surface waters within the Study Area are identified in the descriptions of the water courses that follow. Classification use of all water courses within the Study Area are presented in Table 5 5.

The Study Area is drained by waterways which flow north to south and east to west into the Palmer River, Warren River, Kickemuit River, and Bristol Harbor. Figure 5-4 depicts surface waters within the Study Area.

Pursuant to the requirements of Section 305(b) of the Federal Clean Water Act, waterbodies which are determined to be not supporting their designated uses in whole or in part are considered impaired, and placed on the Clean Water Act, Section 303(d) List of Impaired Waters or have a total maximum daily load (TMDL) assessment where they are prioritized and scheduled for restoration. The causes of impairment are those pollutants or other stressors that contribute to the actual or threatened impairment of designated uses in a waterbody. Causes include chemical contaminants, physical parameters, and biological parameters. Sources of impairment are not determined until a TMDL assessment is conducted on a water body.

Table 5-5 - Surface Water Resources within the Study Area

Water Body Name	Town	Use Classification	Approximate Location
Palmer River	Warren and Barrington	SA	Flows south from the Massachusetts/Rhode Island Boundary into the Warren River
Kickemuit Reservoir (Warren Reservoir)	Warren	AA	North of Child Street, east of Serpentine Road, and south of Schoolhouse Road.
Kickemuit River	Warren and Bristol	SA	Approximately 1,500 to 4,000 feet east of Route 136 (Metacom Avenue)

Water Body Name	Town	Use Classification	Approximate Location
Silver Creek	Bristol	B	Flows south from the Bristol Golf Park into Bristol Harbor.
Unnamed Lake/Pond 1	Warren	Not assessed	470 feet north of the northern end Metacom Avene in an agricultural field
Unnamed Lake/Pond 2	Warren	Not assessed	100 feet northeast of the northern end of St. Teresa Drive
Unnamed Lake/Pond 3	Warren	Not assessed	Immediately east of 426 Metacom Avenue.
Unnamed Lake/Pond 4	Warren	Not assessed	300 feet south of eastern end of Libby Lane
Unnamed Lake/Pond 5	Bristol	Not Assessed	400 feet northeast of eastern end of Echo Farm Drive
Unnamed Lake/Pond 6	Bristol	Not assessed	250 feet east of 663 Metacom Avenue
Unnamed Lake/Pond 7	Bristol	Not assessed	Bristol Golf Park 150 feet west of 55 Ballou Boulevard
Unnamed Lake/Pond 8	Bristol	Not assessed	Bristol Golf Park 150 feet west of 65 Ballou Boulevard
Unnamed Lake/Pond 9	Bristol	Not assessed	Bristol Golf Park 70 feet southwest of 69 Ballou Boulevard
Unnamed Trib to Kickemuit River	Warren	A	Flows southeast under Libby Lane into the Kickemuit River
Unnamed Trib to Palmer River 1	Warren	A	Flows southwest from the Swansea Country Club to Palmer River
Unnamed Trib to Palmer River 2	Warren	A	Flows south to Palmer River east of Market Street and Kickemuit Road intersection
Unnamed Trib to Palmer River 3	Warren	A	Flows north and is culverted under Franklin Street, Child Street, and Market Street into Palmer River east of Jamiel's Park
Unnamed Trib to Palmer River 4	Warren	A	Flows west beginning 350 feet east of Warren Boulevard.
Unnamed Trib to Silver Creek	Bristol	B	Flows south from Hamlet Court into Silver Creek
Unnamed Trib to Warren River	Warren and Bristol	B	Flows north from Bristol into Warren before turning west to Warren River
Warren River	Warren and Barrington	SB	Flows south from North Main Street Bridge between Barrington and Warren to Upper Narragansett Bay

Classification:

AA: Designated as a source of public drinking water supply (PDWS) or as a tributary waters within a public drinking water supply watershed, for primary and secondary contact recreational activities and for fish and wildlife habitat. These waters shall have excellent aesthetic value.

A: Primary and secondary contact recreational activities and for fish and wildlife habitat. Suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have excellent aesthetic value.

B: Fish and wildlife habitat and primary and secondary contact recreational activities. Suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have good aesthetic value.

SA: Designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat. Suitable for aquacultural uses, navigation, and industrial cooling. These waters shall have good aesthetic value. Some waters of this class contain Closed Safety Zones which are waters in the vicinity of an approved sanitary discharge which may be impacted in the event of complete failure of treatment and are therefore, currently prohibited from shellfishing.

SB: Designated for primary and secondary contact recreational activities, shellfish harvesting for controlled relay and depuration, and fish and wildlife habitat. Suitable for aquacultural uses (other than shellfishing for direct human consumption), navigation, and industrial cooling. These waters shall have good aesthetic value.

Source: RIDEM, Water Quality Regulations (December 2023); RIDEM Appendix A. 2014 Index of Waterbodies and Category Listing.

Table 5-6 - Surface Water Resource Categories within the Study Area

Water Body Name	Impairment	Category
Palmer River	Impaired for Fish and Wildlife Habitat, Primary Contact Recreation, Secondary Contact Recreation, Shellfish Consumption	5
Kickemuit Reservoir (Warren Reservoir)	Impaired for Fish and Wildlife Habitat, Primary Contact Recreation, Public Drinking Water Supply, Secondary Contact Recreation	4A
Kickemuit River	Impaired for Shellfish Consumption	4A
Silver Creek	Not Assessed	3
Unnamed Lake/Pond 1	Not assessed	3
Unnamed Lake/Pond 2	Not assessed	3
Unnamed Lake/Pond 3	Not assessed	3
Unnamed Lake/Pond 4	Not assessed	3
Unnamed Lake/Pond 5	Not assessed	3
Unnamed Lake/Pond 6	Not assessed	3
Unnamed Lake/Pond 7	Not assessed	3
Unnamed Lake/Pond 8	Not assessed	3
Unnamed Lake/Pond 9	Not assessed	3
Unnamed Trib to Kickemuit River	Not assessed	3
Unnamed Trib to Palmer River 1	Not assessed	3
Unnamed Trib to Palmer River 2	Not assessed	3
Unnamed Trib to Palmer River 3	Not assessed	3
Unnamed Trib to Palmer River 4	Not assessed	3
Unnamed Trib to Silver Creek	Not assessed	3
Unnamed Trib to Warren River	Not assessed	3
Warren River	NA	2

Category Explanation:

Category 2: Some designated uses attained, and insufficient or no data information is available to determine if remaining uses are attained.

Category 3 Insufficient or no data and information are available to determine if any designated use is attained or impaired. Waterbodies will be placed in this Category where the data or information to support an attainment determination for all uses are not sufficient, consistent with the requirements of the CALM. In general, these uses and waterbodies are considered Not Assessed.

Category 4 Impaired or threatened for one or more designated uses but does not require development of a TMDL. (Three subcategories):

A. TMDL has been completed. Waterbodies will be placed in this subcategory once all TMDLs for the waterbody have been developed and approved by EPA.

B. Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future. Waterbodies will be placed in this subcategory where other pollution control requirements are stringent enough to attain applicable water quality standards.

C. Impairment is not caused by a pollutant. Waterbodies will be placed in this subcategory if pollution (e.g., flow) rather than a pollutant causes the impairment.

Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL. This Category constitutes the 303(d) List of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed.

Source: EPA Watershed Assessment, Tracking, & Environmental Results, 2012 http://ofmpub.epa.gov/tmdl_waters10/attains_state.control?p_state=RI&p_cycle=2012&p_report_type=

5.5.1 Palmer River

Palmer River is an 11-mile state-designated Class SA watercourse that flows southerly from Rehoboth, Massachusetts and between the Towns of Barrington and Warren to the Warren River. As of the 2022 303(d) List of Impaired Waters, the Palmer River is listed for impairment of fecal coliform. A TMDL was created for fecal coliform in Palmer River and was approved by EPA on May 15, 2002. The Palmer River is impaired for fish and wildlife habitat due to dissolved oxygen and total nitrogen, neither of which have TMDLs scheduled. The Palmer River is also impaired for primary and secondary contact recreation and shellfish consumption due to fecal coliform, which has a TMDL in place. The waterbody is currently listed as Category 5 because not all of the required TMDLs have been completed. This waterbody has not been assessed for fish consumption.

5.5.2 Kickemuit Reservoir (Warren Reservoir)

Kickemuit Reservoir (Warren Reservoir) was a state-designated Class AA waterbody north of Child Street, east of Serpentine Road, and south of Schoolhouse Road in Warren. It drained into the Kickemuit River. It was divided from the Kickemuit River by the Lower Kickemuit Dam. A project to remove two dams, including the Lower Kickemuit Dam, on the Kickemuit Reservoir and restore hydrologic connectivity between the Kickemuit Reservoir and River began in the fall of 2023 and was completed in the summer if 2024. As of June 2024, the Lower Kickemuit Dam was removed and hydrologic connectivity between the Kickemuit Reservoir and River has been restored. As of the 2022 303(d) List of Impaired Waters, Kickemuit Reservoir has been unlisted but is still considered impaired due to excess algal growth, fecal coliform, total phosphorus, taste and odor, and turbidity and is therefore considered a Category 4A waterbody, meaning one or more uses are impaired or threatened because a TMDL has been complete. A TMDL was created for fecal coliform and total phosphorus and was approved by the EPA on September 22, 2011. It is impaired for fish and wildlife habitat as well as public drinking water supply due to chlorophyll a, total phosphorus, taste, and turbidity, all of which have plans in place. It is impaired for primary and secondary contact recreation due to fecal coliform, which has a plan in place. It has not been assessed for fish consumption.

5.5.3 Kickemuit River

Kickemuit River is a state-designated Class SA watercourse in Warren and Bristol, Rhode Island. Its headwaters branch from a forested swamp north of Kickemuit Reservoir (Warren Reservoir) and flows southerly parallel to the ROW into Mount Hope Bay. As of the 2022 303(d) List of Impaired Waters, it has been unlisted but is still considered impaired due to fecal coliform and is therefore considered a Category 4A waterbody. A TMDL was created for fecal coliform and approved by the EPA on January 14, 2010. It is impaired for shellfish consumption due to fecal coliform.

5.5.4 Silver Creek

Silver Creek is a state-designated Class B watercourse in Bristol, Rhode Island. Its headwaters originate from the Bristol Golf Park and flows southwesterly to Bristol Harbor. As of the 2022 303(d) List of Impaired Waters, has been unlisted but is still considered impaired due to fecal coliform and is therefore considered a Category 4A waterbody. A TMDL was created for fecal coliform and approved by the EPA on January 14, 2010. It is impaired for shellfish consumption due to fecal coliform.

5.5.5 Unnamed Pond/Lake 1

Unnamed Pond/Lake 1 is in the Lial/Windswept Farm agricultural fields at 25 Serpentine Road in Warren and encompasses approximately one-quarter of an acre. Water quality in Unnamed Lake/Pond 1 has not been assessed and is therefore has been designated a Category 3 waterbody.

5.5.6 Unnamed Lake/Pond 2

Unnamed Lake/Pond 2 is approximately 370 feet north of Kickemuit Road and between Metacom Avenue and Serpentine Road in Warren. It is approximately 0.59 acres and is the source of a branch of Unnamed Tributary to Palmer River 2. Water quality in Unnamed Lake/Pond 2 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.7 Unnamed Lake/Pond 3

Unnamed Lake/Pond 3 is immediately east of 426 Metacom Avenue. It is approximately 0.31 acres and is the source of Unnamed Tributary to Kickemuit River which connects it hydrologically to Unnamed Lake/Pond 4. Water quality in Unnamed Lake/Pond 3 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.8 Unnamed Lake/Pond 4

Unnamed Lake/Pond 4 is approximately 300 feet south of eastern end of Libby Lane in Warren. It is approximately 0.26 acres. It receives flow from Unnamed Lake/Pond 3 via an Unnamed Tributary to the Kickemuit River which ultimately discharges into the Kickemuit River to the east. Water quality in Unnamed Lake/Pond 4 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.9 Unnamed Lake/Pond 5

Unnamed Lake/Pond 5 is approximately 0.09 acres and is approximately 400 feet northeast of the eastern end of Echo Farm Drive in Warren. Water quality in Unnamed Lake/Pond 5 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.10 Unnamed Lake/Pond 6

Unnamed Lake/Pond 6 is approximately 0.1 acres and is approximately 250 feet east of the 663 Metacom Avenue in Bristol. Water quality in Unnamed Lake/Pond 6 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.11 Unnamed Lake/Pond 7

Unnamed Lake/Pond 7 is approximately 0.23 acres and is on the Bristol Golf Park approximately 150 feet west of the 55 Ballou Boulevard in Bristol. Unnamed Lake/Pond 7 is the source of Silver Creek which flows into Unnamed Lake/Pond 8 and 9. Water quality in Unnamed Lake/Pond 7 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.12 Unnamed Lake/Pond 8

Unnamed Lake/Pond 8 is approximately 0.2 acres and is on the Bristol Golf Park approximately 150 feet southwest of the 65 Ballou Boulevard in Bristol. Unnamed Lake/Pond 8 receives flows from Unnamed Lake/Pond 7 via Silver Creek which also flows from Unnamed Lake/Pond 8 to Unnamed Lake/Pond 9. Water quality in Unnamed Lake/Pond 7 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.13 Unnamed Lake/Pond 9

Unnamed Lake/Pond 9 is approximately 0.5 acres and is on the Bristol Golf Park approximately 70 feet southwest of the 65 Ballou Boulevard in Bristol. Unnamed Lake/Pond 9 receives flows from Unnamed Lake/Pond 7 and 8 via Silver Creek. The Bristol Golf Park draws water from the waterbody to irrigate the course. Water quality in Unnamed Lake/Pond 9 has not been assessed and therefore has been designated a Category 3 waterbody.

5.5.14 Unnamed Tributary to Kickemuit River

Unnamed Tributary to Palmer River is a state-designated Class A waterway in Warren. The tributary flows southeasterly from Unnamed Lake/Pond 2 into the Kickemuit River. The unnamed tributary to Kickemuit River has been designated as a Category 3 waterbody.

5.5.15 Unnamed Tributary to Palmer River 1

Unnamed Tributary to Palmer River 1 is a state-designated Class A waterway in Warren. The unnamed tributary originates in Swansea, Massachusetts and flows southwest into the Palmer River approximately 1,000 feet south of the Massachusetts/Rhode Island Boundary in Warren. The tributary crosses the Project ROW between Structure Nos. E183/F184-4 and E183/F184-5. Unnamed tributary to Palmer River 1 has been designated as a Category 3 waterbody.

5.5.16 Unnamed Tributary to Palmer River 2

Unnamed Tributary to Palmer River 2 is a state-designated Class A waterway in Warren. The unnamed tributary is composed of two branches. One branch originates from an area of forested swamp and flows south where it joins the second branch in salt marsh adjacent to the Palmer River. The second branch originates from Unnamed Lake/Pond 1 and flows northwest where it joins the first branch. The unnamed tributary flows into the Palmer immediately east of a culvert that carries the tidal flow of the Palmer River under Market Street. This point is within the Project ROW immediately north of Structure No. F184S-8. Unnamed tributary to Palmer River 2 has been designated as a Category 3 waterbody.

5.5.17 Unnamed Tributary to Palmer River 3

Unnamed Tributary to Palmer River 3 is a state-designated Class A waterway in Warren. The unnamed tributary originates in an area of forested swamp south of Franklin Street in Warren and flows north into the River to the east of Jamiel Park. Between its source and discharge into the Palmer River, it is culverted under Franklin Street, Child Street, and Market Street. Unnamed tributary to Palmer River 3 has been designated as a Category 3 waterbody.

5.5.18 Unnamed Tributary to Palmer River 4

Unnamed Tributary to Palmer River 4 is a state-designated Class A waterway in Warren. Although this watercourse has been identified as a tributary to the Palmer River on the RIDEM ERM, review of the direction of flow shows that the tributary originates in an area of forested swamp and flows west into the Warren River. Between its source and discharge into the Warren River, it is culverted under Warren Avenue and Main Street. Unnamed tributary to Palmer River 4 has been designated as a Category 3 waterbody.

5.5.19 Unnamed Tributary to Silver Creek

Unnamed Tributary to Silver Creek is a state-designated Class B waterway in Bristol. The tributary originates in an area of forested swamp approximately 600 feet east if Main Street. It flows south and into Silver Creek approximately 375 feet north of the Veterans Park Little League Fields. Unnamed tributary to Silver Creek has been designated as a Category 3 waterbody.

5.5.20 Warren River

The Warren River is a 2-mile state-designated Class SB tidal waterbody that flows southerly from the confluence of the Barrington and Palmer Rivers and into Upper Narragansett Bay. The Warren River was not listed in the 2022 303(d) List of Impaired Waters. The Warren River has not been assessed for impairments to fish and wildlife habitat and insufficient information exists to assess impairments to fish consumption. The waterbody is currently listed as Category 2 because it is attaining some of its designated uses but insufficient or not data is available to determine is the remaining uses are attained.

5.5.21 Floodplain

Special Flood Hazard Areas are areas that are subject to inundation by the one percent annual chance flood. Based on available FEMA Flood Insurance Rate Mapping for the towns of Bristol and Warren[5] portions of the Study Area lie within Zone AE Coastal Special Flood Hazard Areas (SFHA). Coastal Zone AE denotes that the Base Flood Elevation (i.e., the water-surface elevation of the one percent annual chance flood) has been determined. Coastal Zone AE SFHAs in the

5 Town of Warren, Map No. 44001C004H, Panel 4 of 18, effective July 7, 2014, Town of Warren, Map No. 44001C007H, Panel 7 of 18, effective July 7, 2014, Town of Warren, Map No. 44001C008H, Panel 8 of 18, effective July 7, 2014

Study Area are located in Warren in areas adjacent to the Kickemuit Reservoir, Kickemuit River, Palmer River, Warren River. The northern portion of the project ROW is within FEMA mapped Coastal SFHA Zone AE with Base Flood Elevation (BFE) 13. Upgradient of the Coastal Zone AE SFHA are areas designated as Coastal Zone X (Areas determined to be outside the 0.2% annual chance floodplain).

It is recognized that, by definition provided in the RIDEM Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (RIDEM 2022) (the RIDEM Freshwater Wetland Rules), a floodplain is the land area adjacent to a river, stream, or other body of flowing water that is, on average likely to be covered with flood waters resulting from a one percent annual chance flood event. In the event that these floodplains are not mapped by FEMA then a registered Professional Engineer may be enlisted to determine the base flood elevation. Therefore, while there are no additional FEMA-mapped Flood Zones within the Study Area, there are several streams and brooks (Silver Creek, Unnamed Tributary to Palmer River 4, Unnamed Tributary to Silver Creek, and Unnamed Tributary to Warren River).

5.5.22 Surface Water Protection Areas

No surface water protection areas are present within the Study Area.

5.6 Groundwater

Groundwater resources within the Study Area are depicted in Figures 5-4. The presence and availability of groundwater resources is a direct function of the geologic deposits in the Study Area. The entire Study Area is classified as GA and GB (RIDEM, 2009). Groundwater resources classified as GA are presumed suitable for public drinking water use without prior treatment, however these resources have a lower potential yield and quality than that of the highest state classification, GAA. The GA class is subject to the same groundwater quality standards and preventative action limits for organic and inorganic chemicals, microbiological substances, and radionuclides as the GAA classification. Groundwater resources classified as GB may not be suitable for drinking water use without treatment due to known or presumed degradation. The GA class is associated with highly urbanized areas primarily those with dense concentrations of industrial and commercial activity.

Potable water sources for the sections of Warren and Bristol within the Project Study Area are serviced by the Bristol County Water Authority (BCWA). The BCWA obtains all of its water supply from the Providence Water Supply Board’s Scituate Reservoir.

One non-community well head protection area (NCWHPA), approximately 210 acres in area, was identified within the study area in Warren east of the Kickemuit Reservoir around Schoolhouse Road. The NCWHPA is associated with a non-community transient well on the former Windmill Hill Golf Course. The golf course is no longer in operation and solar panel arrays have been installed on the property.

5.6.1 Sole Source Aquifers

There are no sole source aquifers located within the Study Area.

5.7 Vegetation

The Study Area contains a variety of upland vegetative cover types typical of southern New England. These types include oak/pine forest, shrubland, hayfield, old field, and managed lawn. This section of the SR focuses on upland communities. Wetland communities are discussed in Section 5.8 of this SR.

5.7.1 Oak Forest Associations

Forested cover types within the Study Area are typically dominated by oaks with or without a white pine (*Pinus strobus*) component. Although these woodlands may appear similar throughout the Study Area, differences in the structure and composition of species in these forests may occur. Soil drainage class, position on the landscape, and slope aspect are important factors in determining the plant associations present at a particular site.

The forests on well-drained and moderately well drained acidic soils are typically composed of red oak, black oak and/or scarlet oak (*Quercus rubra, Q. velutina, and/or Q. coccinea*). White oak (*Q. alba*) is a common component, but rarely dominant. Other common associates, especially in moister sites, include black birch (*Betula lenta*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*) and sassafras (*Sassafras albidum*). Occasionally pitch pine (*Pinus rigida*) or white pine may be encountered. Unless thinned, crown closure is generally greater than 75 percent.

The shrub layer on drier sites is typically dominated by member of the blueberry family including huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*), and lowbush blueberries (*Vaccinium pallidum and V. angustifolium*). Wild sarsaparilla (Aralia nudicaulis), greenbrier (*Smilax rotundifolia*), and hay-scented fern (*Dennstaedia punctilobula*) are common components of the herbaceous stratum (Enser and Lundgren, 2006).

5.7.2 Old Field Community

Upland vegetation within the cleared portions of the ROW is typically representative of an old field successional community. Old field communities are established through the process of natural succession from cleared land to mature forest. Within the cleared ROW, these areas may support a mix of herbs, forbs and shrubs depending on the frequency of vegetation management. Common herbs include Canada and rough-stemmed goldenrod (*Solidago canadensis and S. rugosa*), Alleghany blackberry (*Rubus allegheniensis*), mullein (*Verbascum thapsus*), grass-leaved goldenrod (*Euthamia graminifolia*), tansy (*Tanacetum vulgare*), and wormwood (*Artemisia vulgaris*).

5.7.3 Upland Shrub Communities

The Project ROW has been managed to remove trees as they interfere with safe operation of transmission lines. Shrubs dominate portions of the ROW where succession of abandoned agricultural areas has occurred and where ROW management has resulted in tree sapling removal. Thickets of multiflora rose (*Rosa multiflora*) and Allegheny blackberry are common. Other shrubs commonly found within the managed ROW include autumn olive (*Elaeagnus umbellata*), black cherry (*Prunus serotina*), bebb willow (*Salix bebbiana*), gray birch (*Betula populifolia*), bayberry (*Myrica pensylvanica*), and glossy false buckthorn (*Frangula alnus*).

The understory in these densely stocked stands is weakly developed and often includes poison ivy (*Toxicodendron radicans*), greenbier (*Smilax rotundifolia*) sensitive fern (*Onoclea sensibilis*), and wild geranium (*Geranium maculatum*).

5.7.4 Managed Lawn/Grass

Portions of the cleared ROW contain managed residential lawn and commercial golf courses. Typically, these areas consist of a continuous grass cover which may include Kentucky bluegrass (*Poa pratensis*), red fescue (*Festuca rubra*), clover (*Trifolium sp*.), and plantains (*Plantago sp*.). Ornamental shrubs may also be located within these areas.

5.7.5 Agricultural Areas

The ROW crosses one parcel of agricultural land that is managed as pasture for cattle and hayfields. Pasture and hayfields are typically managed in European cool season grasses such as timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), sweet vernal grass (*Anthoxanthum odoratum*), clover (*Trifolium spp*.) and several weed species.

Agricultural land managed in corn and row crops are encountered is present within the study area. Large fields are managed in corn and smaller fields in vegetables crops. These fields are tilled between plantings and are often provided a cover crop such as winter rye to reduce soil loss during intercrop periods.

5.8 Wetlands

Wetlands have been identified as resources potentially providing ecological functions and societal values. Wetlands are characterized by three criteria including the (i) presence of undrained hydric soils, (ii) a prevalence (>50 percent) of hydrophytic vegetation, and (iii) wetland hydrology, soils that are saturated near the surface or flooded by shallow water during at least a portion of the growing season.

5.8.1 Study Area Wetlands

State-regulated freshwater and coastal wetlands and streams have been identified and delineated within the ROW. Figure 5-5 depicts wetlands field delineated within the Project ROW and those wetland resource areas outside of the ROW have been mapped using the wetlands shapefile[6] from the RIGIS website. Field methodology for the delineation of State-regulated resource areas was based upon vegetative composition, presence of hydric soils, and evidence of wetland hydrology. Based on the provisions of the Rhode Island Fresh Water Wetlands Act and the RIDEM Freshwater Wetland Rules, State-regulated freshwater wetlands include swamps, marshes, emergent plant communities and other areas dominated by wetland vegetation with evidence of wetland hydrology. Based on the Coastal Resource Management Council's (CRMC) Coastal Resource Management Program, State-regulated coastal wetlands include salt marsh. Swamps are defined as wetlands dominated by woody species and where groundwater is at or near the surface or where runoff from surface drainage frequently collects. Woody species in

6 University of Rhode Island Environmental Data Center. 1993. Wetlands Shapefile as interpreted from 1988 aerial photography; Cowardin 16 classification scheme.

swamps may be tree or shrub species. Marshes are wetlands dominated by nonwoody, typically-emergent species that exist in standing or running water during the growing season. Emergent wetlands communities are characterized by erect, rooted, herbaceous hydrophytic vegetation that is present for most of the growing season and may or may not be persistent. Salt marshes are tidal wetlands that are regularly or irregularly inundated by salt water through either natural or artificial water courses.

The upland areas abutting freshwater wetlands may be regulated under the RIDEM Freshwater Wetland Rules as Buffer Zone and/or Jurisdictional Area. Upland areas abutting coastal wetlands may be regulated under the CRMC Coastal Resources Management Program (CRMP) if they are within the 200-Foot Contiguous Area that is established from the inland most edge of coastal features. Table 5.7 summarizes the Buffer Zones and Jurisdictional Areas associated with the wetland types in the study area.

Table 5-7 - RIDEM-Regulated Areas Associated with Wetlands within Study Area

Wetland Type	Buffer Zone (feet)	Jurisdictional Area (feet)
Marsh – Any Size	100	100
Marsh – Wet Meadow or Phragmites Marsh Greater Than or Equal to One Acre	50	100
Marsh – Wet Meadow or Phragmites Marsh Less Than One Acre	25	100
Swamp – Any Less Than One Acre	25	100
Swamp – Deciduous Forested Greater Than or Equal to Ten Acres	75	100
Swamp – Deciduous Forested Greater Than One Acre and Less Than Ten Acres	50	100
Swamp – Shrub Swamp Greater Than or Equal to One Acre	75	100
Salt Marsh[1]	NA	200

Source: Rhode Island Department of Environmental Management, Office of Water Resources. 2022. Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (250-RICR-150-15-3).

Buffer Zone and Jurisdictional Area are measured horizontally from the wetland edge.

Buffer Zone and Jurisdictional Area specific to wetlands within River Protection Region 2.

An additional 25 feet will be added to the buffer zone width when one or more differing wetland types or subtypes are present within 25 feet inward of the freshwater wetland edge, but in no case will a buffer zone exceed the limit of a jurisdictional area.

1 No Buffer Zone is associated with Salt Marsh but the CRMC establishes a regulated 200-Foot Contiguous Area from the inland most edge of the Salt Marsh.

In addition to these vegetated wetland communities, Rhode Island also regulates activities in and around streams and open water bodies, which include Rivers, Ponds, and Areas Subject to Storm Flowage (ASSF). A River is any perennial stream indicated as a blue line on a USGS 7.5-minute series topographic map. Rivers in the Study Area receive a 100-foot Buffer Zone and 200-foot Jurisdictional Area unless they support a cold-water fishery or are specifically name in §3.23.H.6 in the RIDEM Rules. Streams in the Study Area receive a 100-foot Buffer Zone and 200-foot Jurisdictional Area.

A Pond is an area of open standing or slow-moving water present for six or more months during. All ponds receive a 200-foot Jurisdictional Area and Buffer Zone is determined by the size of the pond. Ponds greater than or equal to ten acres receive a 100-foot Buffer Zone unless specified in §3.23.H.2.b. Ponds greater than or equal to one quarter acre and less than ten acres receive a 50-foot Buffer Zone. Ponds less than one quarter acre receive a 25-foot Buffer Zone.

Wetland vegetation community types and their dominant plant species within the existing Project ROW are described below.

5.8.1.1 Ponds

Ponds are defined as a place, natural or manmade, where open standing or lowly moving water is present for at least six months a year. Nine small unnamed ponds are present within the Study Area.

The Project ROW crosses three of these ponds on the Bristol Golf Park near the southern extent of the ROW.

5.8.1.2 Swamp

Swamps are defined as being dominated by woody vegetation, where groundwater is at or near the ground surface for a significant part of the growing season or where runoff water from surface drainage collects frequently. Buffer Zones and Jurisdictional Areas for Swamps in the Study Area are summarized in Table 5.7

Dominant species in Swamps with shrub cover include sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), smooth alder (*Alnus serrulata*), and silky dogwood (*Swida amomum*). Other species in these swamps include arrowwood (*Viburnum dentatum*), and Bebb willow. Drier portions of Shrub Swamps are often densely overgrown with wild grape (*Vitus labrusca*) and greenbrier. Common species in the herbaceous layer include cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern, poison ivy, and dewberry (*Rubus hispidus*). Shrub Swamp generally occurs in areas where wetlands are in the managed ROW and trees are periodically removed.

Forested Swamps are not present within the managed portions of the ROW. Dominant canopy species in forested swamps within the Study Area include red maple, willow (*Salix sp.*), black gum, American elm (*Ulmus americana*) and swamp white oak (*Quercus bicolor*).

5.8.1.3 Marsh

Marshes are wetlands where the vegetation is dominated by emergent herbaceous species which exist in standing or running water during the growing season. The best example of Marsh in the Study Area is within the Project ROW in Warren between the Massachusetts/Rhode Island Boundary and the Highlander Charter School adjacent to salt marsh. Marsh vegetation is typically dominated by broad-leaved cattail (*Typha latifolia*) and common reed (*Phragmites australis*) with lesser amounts of buttonbush (*Cephalanthus occidentalis*), marsh fern (*Thelypteris palustris*), woolgrass (*Scirpus cyperinus*), and purple loosestrife (*Lythrum salicaria*).

5.8.1.4 Salt Marshes

Salt Marshes are tidal wetlands that are regularly or irregularly inundated by salt water. The best example of a Salt Marsh is within the Project ROW in Warren between the Warren Family Fun Center/Driving Range at 326 Market Street and the Warren Substation at 34 Norbert Street. Salt

Marsh vegetation is predominately smooth cordgrass (*Spartina alterniflora*), salt meadow grass (*Spartina patens*), spike grass (*Distichlis spicata*), black rush (*Juncus gerardi*), saltworts (*Salicornia spp*.), sea lavender (*Limonium carolinianum*), saltmarsh bulrushes (*Scirpus spp*.), and high tide bush (*Iva frutescens*). Salt Marshes include areas of high salt marsh and low salt marsh. High salt marsh are areas of Salt Marsh that are typically flooded by spring, moon, or other flooding tides but is not flooded on a daily basis. Vegetation is high salt marsh are typically composed of salt meadow grass, short-form smooth cordgrass, spike grass, black rush, tall reed (*Phragmites communis*), sea lavender, tall cordgrass (*Spartina pectinata*), saltmarsh bulrushes, and high tide bush. Low salt marsh are areas of Salt Marsh that is flooded daily. Vegetation in low salt marsh is predominantly smooth cordgrass.

5.8.1.5 Rivers

Rivers are defined as a body of water that is designated as a perennial stream by the United States Department of Interior Geologic Survey on 7.5-minutew series topographic maps. Rivers within the Study Area include Palmer River, Kickemuit River, Warren River, Silver Creek, four unnamed tributaries to Palmer River, on unnamed tributary to Kickemuit River, one unnamed tributary to Warren River, and one unnamed tributary to Silver Creek.

5.8.1.6 Stream/Intermittent Stream

Streams and intermittent streams are flowing bodies of water or watercourses that are not rivers which flow long enough each year to develop and maintain a defined channel. Streams often are associated with the headwaters of named Rivers and tributaries with downstream confluences. Further descriptions of these watercourses are provided in Section 5.5 of this SR.

5.8.1.7 Emergent Plant Community

Emergent plant communities within the Study Area are associated with areas that are mowed with sufficient frequency to control the establishment of woody vegetation. Within the ROW they include portions of golf courses, pastures and lawns. Common species associated with these areas include rough-stemmed goldenrod, New England aster (*Symphotrichum novae-angliae*), Joe-Pye weed (*Eutrochium maculatum*), sensitive fern, soft rush, straw-colored flatsedge (*Cyperus strigosus*), purple agalinis (*Agalinis purpurea*), and reed canary grass (*Phalaris arundinacea*).

5.8.1.8 Shrub/Forested Wetland

Wetlands that are not Swamps or Marshes and are dominated by woody vegetation are classified as either Shrub Wetlands or Forested Wetlands. In the Project ROW, Shrub Wetlands often include highbush blueberry, sweet pepper bush, arrowwood, multiflora rose, winterberry, and elderberry (*Sambucus canadensis*). Associated herbaceous species may include skunk cabbage, cinnamon fern, and jewelweed (*Impatiens capensis*).

Forested wetlands occur at the edge of the maintained ROW where most shrub wetlands are also present. Vegetation includes red maple, American elm, and black gum with an understory generally consisting of vegetation mentioned previously in the shrub wetland.

5.8.1.9 Floodplain

A floodplain is the land area adjacent to a river or stream or other body of flowing water that is, on the average, likely to be covered with flood waters resulting from a one percent annual chance flooding event. These regulated floodplain areas include areas mapped by FEMA, as well as un-mapped floodplain.

5.8.1.10 Areas Subject to Storm Flowage

ASSFs are channel areas and water courses which carry storm, surface, groundwater discharge or drainage waters out of, into, and/or connect freshwater wetlands or coastal wetlands. ASSFs are recognized by evidence of scouring and/or a marked change in vegetative density and/or composition. One ASSF Area is present between Structure No. E183-3-26 and the Warren Substation and flows northeast to a freshwater wetland adjacent to salt marsh and under the proposed work pad for Structure No. F184N-5-1 (see Figure 1-2, page 7 of 22).

5.9 Wildlife

The wildlife species present within the Study Area vary according to the habitat resources present. The suitability of a habitat for a particular species is influenced by its setting (inland, terrestrial, wetland/deep water, etc.) along with current and historic land management practices which affect the floristic composition and structure of the vegetation cover types present. The proposed Project includes work in or proximate to 11 different habitats that are identified in New England Wildlife: Habitat, Natural History and Distribution (DeGraaf and Yamasaki, 2001). Habitat resources are variable across the Study Area.

The Project is oriented in a north to south direction and follows the coastline in the northern portion of the Project and near the center of Warren and Bristol in the central and southern portions of the Project. The existing lines are constructed through woodlands, farmlands and residential housing and commercial developments within a cleared ROW. This ROW passes through tidal wetlands, palustrine wetlands, over perennial and intermittent streams, and over and within the proximity of four waterbodies, Palmer River and three unnamed ponds. The ROW is subject to routine vegetation management to ensure that adequate clearance is maintained between the vegetation and the overhead conductors, fostering the development of shrubland and herbaceous cover types.

An overall list of wildlife species that could potentially occur within the Study Area has been compiled based upon the major habitats present. This list relies on species geographical distribution data provided by DeGraaf and Yamasaki (2001) and August et al. (2001), with information on certain amphibians and reptiles supplemented by Amphibians and Reptiles of Connecticut and Adjacent Regions (Klemens, 1993). It should be noted that individual species may not occur in any given part of the Study Area even if apparently suitable habitat is present.

Table 5-8 provides a list of vertebrates (amphibian, reptiles, birds, and mammals) with the potential to occupy specific habitats in the Project Study Area. Species observed in the field are annotated in this table. Observations include direct visual identification of the animal, its tracks, or scat, or in the case of birds and frogs additionally by vocalizations.

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Table 5-8 - Expected and Observed Wildlife Species within the Study Area

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
AMPHIBIANS AND REPTILES																	
Marbled Salamander	X					X	X	X	X	X				X			
Spotted Salamander	X					X	X		X	X				X			
Red-spotted Newt	X					X	X		X	X	X	X		X			
Northern Dusky Salamander	X					X	X			X		X		X			
Northern Redback Salamander	X	X														X	
Four-toed Salamander	X					X	X	X				X		X			
Northern Two-Lined Salamander	X											X	X	X			
Eastern Spadefoot	X		X	X													
American Toad	X	X	X	X		X	X	X	X	X	X	X		X			
Fowler's Toad	X		X	X		X	X			X	X			X			
Northern Spring Peeper	X					X	X	X	X	X	X	X		X			
Gray Treefrog	X					X			X	X	X			X			
American Bullfrog	X							X	X	O	X	X	X	X			
Green Frog						X	X	X	X	X	X	X	X	X			
Wood Frog	X					X	X	X	X	X		X		X			

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Northern Leopard Frog[rare]	X					X	X	X	X								
Pickerel Frog	X			X		X	O			X	X	X					
Common Snapping Turtle	X	X	X	X				X		X	X	X	X	X	X		
Spotted Turtle	X	X	X	X		X	X	X	X	X		X		X	X		
Northern Diamond-backed Terrapin															X		
Wood Turtle	X	X	X	X		X	X	X	X	X	X	X	X	X			
Eastern Box Turtle	X	X		X		X	X					X		X			
Painted Turtle				X		X			X	X	X	X		X	X		
Common Musk Turtle		X		X			X	X	X	X	X	X	X	X			
Northern Water Snake							X		X	X	X	X	X	X			X
Northern Red-bellied Snake	X	X				X	X		X								X
Northern Brown Snake	X	X	X	X		X	X		X							X	
Common Garter Snake	X	X		X		X	X	X	X	X		X		X		X	X
Ribbon Snake						X	X	X	X	X	X	X		X			
Eastern Hognose Snake	X	X	X	X		X		X						X			X

	Terrestrial Habitats									Aquatic Habitats							Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Northern Ringneck Snake						X										X	
Northern Black Racer	X	X		X		X		X	X					X		X	X
Eastern Smooth Green Snake	X	X		X		X	X	X	X					X			
Black Rat Snake	X	X				X										X	X
Eastern Milk Snake	X	X		X		X							X			X	X
BIRDS																	
Double-crested Cormorant[B]										X	X		X	X	O		
Least Bittern[B] (Rare)								X	X	X	X	X	X	X	X		
Great Blue Heron[B]						X	X	X	X	X	X	X	X	X	O		
Great Egret[B]										X	X	X	X	X	X		
Snowy Egret[B]						X	X	X					X	X	O		
Little Blue Heron[B]						X	X	X	X	X	X			X			
Green Heron[B]						X	X	X	X	X	X	X	X	X	X		
Black-crowned Night Heron[B]								X	X	X		X	X	X	X		
Yellow-crowned Night Heron[B]								X	X	X				X			
Glossy Ibis[B]							X	X	X	X	X	X	X				

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Turkey Vulture^{B}	X		X	X													
Canada Goose^{B}			X	X	O		X	X		X		X	X	X	X		
Mute Swan^{B}			X	X			X			X	X	X	X	X	X		
Wood Duck^{B}						X		X	X	X	X	X	X	X			
American Widgeon^{M}							X	X		X	X				X		
American Black Duck^{B}							X	X	X	X	X	X	X	X	X		
Mallard^{B}			X	X			X	X	X	X	X	X	X	X	X		
Canvasback^{M}								X			X						
Ring-necked Duck^{M}									X	X	X	X	X	X			
Northern Pintail^{M}								X							X		
Green-winged Teal^{M}								X		X					X		
Blue-winged Teal^{B}								X		X					X		
Gadwall^{M}							X	X	X	X	X			X	X		
Bufflehead^{M}											X	X	X		X		
Common Goldeneye^{M}										X	X	X	X		X		
Common Merganser^{M}	X									X	X	X	X				
Red-breasted Merganser										X	X	X	X	X	X		
Osprey^{B}										X	X	X	X		O		O
Bald Eagle^{M}											X	X	X	X			

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Northern Harrier[M]		X	X				X	X	X						X		
Sharp-shinned Hawk[M]	X	X															
Cooper's Hawk[B (Rare)]	X	X		X		X											
Northern Goshawk[B (Rare)]	X	X		X		X											
Red-shouldered Hawk[B]	X								X					X			
Broad-winged Hawk[B]	X		X	X													
Red-tailed Hawk[B]	X	X	X	X		X			X								
Rough-legged Hawk[M]		X	X	X			X	X	X						X		
American Kestrel[B]		X	X	X			X	X							X		
Peregrine Falcon[M]		X	X	X	X		X	X	X				X	X	X		
Ring-necked Pheasant[B]		X	X	X													
Ruffed Grouse[B]	X	X		X													
Wild Turkey[B]	X	X	X	X													
Northern Bobwhite[B (Rare)]	X	X	X	X													
Virginia Rail[B]								X							X		
Sora[B (Rare)]							X	X	X	X					X		

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Killdeer[B]			X				X	X						X	X		
Willet[B]							X	X							X		
Spotted Sandpiper[B]				X						X	X	X	X	X			
Wilson's (Common) Snipe[M]		X					X	X	X					X	X		
American Woodcock[B]		X	X			X	X		X								
Ring-billed Gull[B]											X	X	X		X		
Herring Gull[B]										X	X	X	X		X		
Greater Black-backed Gull															X		
Common Tern[B]											X				X		
Rock Pigeon[B]			X	X												X	X
Mourning Dove[B]	X	X	X	X													O
Black-billed Cuckoo[B]	X	X							X								
Yellow-billed Cuckoo[B]	X	X															
Barn Owl[B (Rare)]			X	X													X
Eastern Screech-Owl[B]	X	X		X		X	X	X						X			
Great Horned Owl[B]	X	X		X		X	X		x					X			
Barred Owl	X	X		X		X						X	X	X			

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Long-eared Owl[B]	X	X		X			X	X									
Short-eared Owl[M]				X				X									
Northern Saw-whet Owl[B (Rare)]	X			X		X											
Common Nighthawk [B] (Rare)	X	X	X	X			X							X			X
Whip-poor-will[B]	X	X	X	X													
Chimney Swift[B]		X	X	X			X									X	X
Ruby-throated Hummingbird[B]	X	X				X											
Belted Kingfisher[B]										X	X	X	X	X			
Red-headed Woodpecker[b]	X													X			
Red-bellied Woodpecker[B]	X													X			
Downy Woodpecker[B]	X					X											
Hairy Woodpecker[B]	X					X								X			
Northern Flicker[B]	X		X	X		X										X	X
Eastern Wood-Pewee[B]	X					X								X			

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Acadian Flycatcher[B] (Rare)	X					X								X			
Alder Flycatcher[B]	X	X							X					X			
Willow Flycatcher[B]	X	X				X											
Least Flycatcher[B]	X					X								X			
Eastern Phoebe[B]	X					X										X	X
Great Crested Flycatcher[B]	X					X											
Eastern Kingbird[B]	X	X		X		X											
Northern Shrike[M]	X	X		X		X	X	X									
White-eyed Vireo[B]	X	X				X			X					X			
Warbling Vireo[B]	X					X								X			
Red-eyed Vireo[B]	X					X								X			
Blue Jay[B]	O					O								X			
American Crow[B]	X	X	O	X		X									X		
Fish Crow[B] (Rare)								X		X	X	X	X	X	X		
Horned Lark [B] (Rare)			X	X													
Purple Martin[B]		X	X	X			X	X		X	X	X	X	X	X		X

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Tree Swallow[B]	X	X	X	X		X	X	X	X	X	X	X	X	X	X		
Northern Rough-winged Swallow[B]	X	X	X	X			X	X		X		X	X	X			
Bank Swallow[B]	X	X	X	X			X	X		X		X	X	X	X		
Barn Swallow[B]	X	X		X			X	X		X		X	X	X	X	X	X
Black-capped Chickadee[B]	X	X				X								X			
Tufted Titmouse[B]	O	X				O								X			
Red-breasted Nuthatch[B] (Rare)	X					X											
White-breasted Nuthatch[B]	X					X								X			
Brown Creeper[B]	X					X								X			
Carolina Wren[B]	O	X				X								X			
House Wren[B]	X	X				X								X		X	
Winter Wren[M]	X					X			X					X			
Marsh Wren[B]								X	X						X		
Golden-crowned Kinglet[B] (Rare)	X					X											
Ruby-crowned Kinglet[M]	X					X											
Blue-gray Gnatcatcher[B]	X	X				X			X								

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Eastern Bluebird[B]	X	X		X		X											
Veery[B]	X	X				X								X			
Hermit Thrush[B]	X	X				X			X								
Wood Thrush[B]	X					X								X			
American Robin[B]	X		X	X		X			X					X		X	
Gray Catbird[B]	X	X				X								X			
Northern Mockingbird[B]		X				X											
Brown Thrasher[B]	X	X												X			
European Starling[B]	X		O	O		X	X							X	X	X	
Cedar Waxwing[B]	X	X				X			X					X			
Blue-winged Warbler[B]	X	X		X					X								
Nashville Warbler[B (Rare)]	X								X								
Yellow Warbler[B]	X	X				X			X					X			
Chestnut-sided Warbler[B]		X				X			X								
Yellow-rumped Warbler[M]	X	X				X			X								
Black-throated Green Warbler[B]	X					X											
Pine Warbler[B]	X																

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Prairie Warbler[B]	X	X															
Black–and-white Warbler[B]	X					X								X			
American Redstart[B]	X					X								X			
Worm-eating Warbler[B]	X																
Ovenbird[B]	X					X											
Northern Waterthrush[B]						X			X			X	X	X			
Common Yellowthroat[B]	X	X		X		X	X	X	X	X				X			
Canada Warbler[B]	X					X			X					X			
Yellow-breasted Chat		X												X			
Scarlet Tanager[B]	X					X											
Eastern Towhee[B]	X	X		X		X											
American Tree Sparrow[M]		X		X			X	X	X					X			
Chipping Sparrow[B]	X		X	X													
Field Sparrow[B]		X	X	X													
Vesper Sparrow[M]		X	X	X	X		X										
Savannah Sparrow[B]			X	X			X	X							X		

	Terrestrial Habitats									Aquatic Habitats							Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh		Debris Pile	Structure
Grasshopper Sparrow[B (Rare)]			X	X														
Fox Sparrow[M]	X	X																
Song Sparrow[B]	O	O	X	X		O	X	X	O					X				
Swamp Sparrow[B]							X	X	X	X				X				
White-throated Sparrow[B (Rare)]	X	X		X		X								X				
Dark-eyed Junco[B (Rare)]	X	X		X														
Lapland Longspur[M]			X	X											X			
Snow Bunting[M]			X	X			X	X										
Northern Cardinal[B]	X	X				X			O			X	X	X				
Rose-breasted Grosbeak[B]	X	X				X			X			X	X	X				
Indigo Bunting[B]	X	X		X										X				
Bobolink[B]				X			X	X										
Red-winged Blackbird[B]			X	X		X	X	X	X	X				X	X			
Eastern Meadowlark[B]			X	X														
Rusty Blackbird[M]						X			X	X		X	X	X				

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Common Grackle[B]	X		X	X		X	X	X	X		X			X			
Brown-headed Cowbird[B]	X	X	X	X		X	X	X						X			
Orchard Oriole[B (Rare)]	X					X								X			
Baltimore Oriole[B]	X					X								X			
Pine Grosbeak[M]	X		X														
Purple Finch[B]	X					X											
House Finch[B]	X																
Common Redpoll[M]			X	X													
Pine Siskin[M]	X			X		X								X			
American Goldfinch[B]	X	X	X			X		X	X					X			
Evening Grosbeak[M]	X					X											
House Sparrow[P]		X	X	X											X	X	
MAMMALS																	
Virginia Opossum	X	X		X		X	X	X	X					X	X	X	
Masked Shrew	X	X		X		X	X	X	X					X	X		
Northern Short-tailed Shrew	X	X		X		X	X	X	X					X	X		
Hairy-tailed Mole	X	X		X		X	X	X	X								

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Eastern Mole	X	X	X	X	X	X											
Star-nosed Mole						X	X	X	X	X	X	X	X	X	X		
Little Brown Myotis	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Northern Myotis	X	X	X	X		X	X	X	X	X	X	X	X	X			X
Silver-haired Bat^{M}	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Eastern Pipistrelle^{B}	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Big Brown Bat^{B}	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Red Bat^{B}	X	X	X	X		X	X	X	X	X	X	X	X	X	X		
Hoary Bat^{M}	X	X	X	X		X	X	X	X	X	X	X	X	X	X		
Eastern Cottontail^{B}	X	X		X		X	X	X	X					X	X		
Snowshoe Hare^{B}	X	X				X			X					X			
Eastern Chipmunk^{B}	X	X		X		X											
Woodchuck^{B}	O	O	X	X		O										X	
Gray Squirrel^{B}	X					X								X			
Red Squirrel^{B}	X					X											
Southern Flying Squirrel^{B}	X					X											
White-footed Mouse^{B}	X	X		X		X	X		X					X		X	X

	Terrestrial Habitats									Aquatic Habitats						Other	
	Oak/ Pine Forest	Shrub/ Old Field	Ag. Field	Grass Field	Lawn Fairway	Red Maple Swamp	Wet Meadow	Shallow Marsh	Shrub Swamp	Pond	Lake	Stream	River	Riparian	Estuary/Salt Marsh	Debris Pile	Structure
Southern Red-backed Vole[B]	X	X	X	X		X			X					X			
Meadow Vole[B]	X	X	X	X		X	X	X	X					X	X		
Woodland Vole[B]	X	X		X		X											
Muskrat[B]							X	X	X	X	X	X	X	X	X		
Southern Bog Lemming[B (Rare)]	X	X		X		X	X	X						X			
Norway Rat[B]		X	X	X		X									X	X	X
House Mouse[B]		X	X	X		X										X	X
Meadow Jumping Mouse[B]	X	X		X		X	X	X	X					X	X		
Coyote[B]	X	X	X	X		X	X	X	X					X		X	
Red Fox[B]	X	X	X	X		X	X	X	X					X	X	X	
Gray Fox[B]	X	X	X			X	X	X	X					X		X	
Raccoon[B]	X	X	X	X		X	X	X	X					X	X	X	
Ermine[B (Rare)]	X	X	X	X		X			X					X		X	X
Long-tailed Weasel[B]	X	X	X	X		X	X	X	X					X	X		X
Mink[B]	X					X	X	X	X	X	X	X	X	X	X		
Striped Skunk[B]	X	X	X	X		X	X	X	X					X	X	X	X
River Otter[B]	X					X		X	X	X	X	X	X	X	X		
Bobcat	X	X		X		X	X		X						X		
White-tailed Deer[B]	X	O	X	X	X	X	X	X	O					X	X		

Legend: X = expected to occur O = observed by VHB Fall 2023 B = breeding in Rhode Island M = migrant/visitor

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5.10 Osprey Nesting

Eight osprey nests are present in the Project ROW. Three are on existing structures supporting the E183-3 and F184N-4 Lines that will be removed as part of the Project. Four osprey nests are on standalone structures adjacent to the E183-3 and F184N-4 Lines. One nest is on a platform installed on top of a wooden utility structure supporting the 2295 Sub Transmission Line adjacent to the F184N-5 Line. When nests on existing structures that will be replaced are abandoned and prior to the start of osprey migration in March, avian deterrents will be installed to discourage nest establishment. Standalone structures and dedicated platforms on the adjacent sub transmission line structure will not be affected as a result of this project. Two osprey nesting platforms are proposed in salt marsh in the vicinity of the Warren Substation. This will be accomplished by leaving two poles comprising existing h-frame structures in salt marsh and installing nest platforms. For osprey nest management, TNEC has both a USFW Migratory Bird Special Purpose Utility Permit and a RIDEM Division of Fish and Wildlife Nest Removal Permit which they renew annually.

5.11 Fisheries

The Kickemuit Reservoir, previously located in Warren, was the only large freshwater body in the Study Area. It was an artificial impoundment created by a dam on the Kickemuit River immediately north of Child Street, which has been removed. The removal of the dam reconnected the reservoir to the Kickemuit River and will not allow for tidal effect in the former reservoir.

The RIDEM Division of Fish and Wildlife conducted fish surveys in Rhode Island's streams and ponds between 1993 and 2002. The Kickemuit Reservoir was the only waterbody within the Study Area surveyed as part of the study. The primary means of sampling were electrofishing units via boat. The survey identified alewife herring (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). These species are anadromous, meaning they migrate from the ocean and estuaries up freshwater rivers and streams to spawn. Although not surveyed, alewife and blueback herring are expected to occur in the Kickemuit River. Before the removal of the dam immediately north of Child Street, a fish ladder was present at the dam indicating that fish migration between the Kickemuit Reservoir and Kickemuit River was occurring. The fishery is still supported by the Kickemuit River which now flows unobstructed from the Massachusetts/Rhode Island boundary.

5.12 Rare and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation (IPaC) project planning tool was originally queried on September 22, 2023 and rerun on October 21, 2025 to determine if any federally listed or proposed, threatened and endangered species protected under the Federal Endangered Species Act are within the Study Area. This query resulted in the identification of the northern long-eared bat (NLEB) (*Myotis septentrionalis*), a federally endangered species, tricolored bat (*Perymyotis subflavus*), a federally proposed endangered species and monarch butterfly (*Danaus plexippus*), a candidate species. NLEB and tricolor bat have suffered severe population declines from white-nose syndrome. The IPaC tool reached the determination of "May Effect" for NLEB and tricolored bat. TNEC has initiated consultation with

USFWS and will coordinate with the agency to satisfy their requirement for the Project. As a Proposed Endangered Species, tricolored bat technically does not have any legal protections under the ESA. As a Candidate Species, the monarch butterfly technically does not have any legal protections under the ESA. No specific Critical Habitats have been designated for any of the species.

The Rhode Island Natural Heritage Program (RINHP) database hosted on the RIDEM Environmental Resource Mapping website identifies three Natural Heritage Program polygons that are within the Study Area. The first covers the Study Area in Warren from the Massachusetts/Rhode Island Boundary to Franklin Street. The second covers a portion of the Warren River and the surrounding western shore in Warren and Bristol to the west of the Project ROW. The third is associated with Silver Creek in Bristol and is to the south of the Project ROW terminus at Gooding Avenue. VHB requested information concerning this polygon from Paul Jordan, the Supervising Geographic Information System Specialist from RIDEM, and received his reply on January 12 and 13, 2023 and May 29, 2024. Mr. Jordan indicated that the species represented within the polygons are 12 plants, one amphibian, one reptile, and one bird. Plant species include Atlantic mock bishop's weed (*Ptilimnium capillaceum*), yellow thistle (*Circium horridulum var. horridulum*), woodland-sunflower (*Helianthus divaricatus*), hairy pine-sap (*Hypopitys lanuginosa*), colic-root or stargrass (*Aletris farinosa*), white fringed bog-orchid (*Platanthera blephariglottis*), slimspike three-awn or northern poverty-grass (*Aristida longespica var geniculata*), purple/arrowfeather three-awn or three-awned grass (*Aristida purpurascens var. purpurascens*), drum-heads or cross-leaved milkwort or marsh-milkwort (*Polygala cruciate ssp. aquilonia*), ditch-stonecrop (*Penthorum sedoides*), clearweed or coolwort or richweed (*Pilea fontana*), and eastern gammagrass (*Tripsacum dactyloides*). Northern leopard frog (*Lithobates pipiens*) was the one amphibian species identified by RINHP, Northern diamond-backed terrapin (*Malaclemys terrapin*) was the one reptile species identified by RINHP, and Seaside sparrow (*Ammodramus maritimus*) was the one bird species identified by RINHP. Additional rare, threatened, or endangered plant species with known occurrences in the Project ROW were provided by the Warren Land Trust, who manage the Haile Farm Preserve portion of the Project ROW, on November 10, 2023. These plant species included whip nutsedge (*Scleria triglomerata*), purple screwstem (*Bartonia iodandra*), knotroot foxtail (*Setaria parviflora*), crowned beggar-tick (*Bidens trichosperma*), and Indian grass (*Sorghastrum nutans*). Of the species identified in the Study Area, only nine plant species are within the Project ROW. While northern leopard frog, diamondback terrapin, and seaside sparrow were not identified within the Project ROW, they are mobile species that may move into the Project ROW. A description of these species is provided below.

Plants and animals listed as State Endangered are protected under the provisions of the Rhode Island State Endangered Species Act, Title 20 of the General Laws of the State of Rhode Island. This law states, in part (20-37-3): "No person shall buy, sell, offer for sale, store, transport, import, export, or otherwise traffic in any animal or plant or any part of any animal or plant whether living or dead, processed, manufactured, preserved or raw (if) such animal or plant has been declared to be an endangered species by either the United States secretaries of the Interior or Commerce or the Director of the Rhode Island Department of Environmental Management" (Enser, 2007).

The plants and animals have also been assigned a global rank that reflects its rarity and vulnerability to extinction throughout the world. Global ranks were originally developed by the

Nature Conservancy and are used by all Natural Heritage Programs as a standardized method of determining the status of each species throughout its range.

5.12.1 Atlantic Mock Bishop's-Weed

The New England Wildflower Society's website indicates that Atlantic mock bishop's-weed is found in brackish or salt marshes as flats in the intertidal or subtidal zones or in open ocean (New England Wildflower Society, n.d.). Atlantic mock bishop's-weed is also considered an obligate wetland plant (USDA). The flowering period is year-round (Lady Bird Johnson Wildflower Center, n.d.).

Atlantic mock bishop's-weed is listed as a species of State Concern in Rhode Island (Enser, 2007). This designation means that it is not considered to be State Endangered or Threatened at the present time, but it is listed due to various factors of rarity and/or vulnerability (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of Atlantic mock bishop's-weed have been identified within the Project ROW.

5.12.2 Yellow Thistle

The New England Wildflower Society's website indicates that yellow thistle is found in meadows and fields and on the upper edges of salt marshes or flats (New England Wildflower Society, n.d.). Yellow thistle is considered a facultative upland plant (USDA) that occasionally occurs in wetlands. The flowering period is April through June (Lady Bird Johnson Wildflower Center, n.d.).

Yello thistle is listed as a State Threatened species in Rhode Island (Enser, 2007). This classification means that it is a native species which is likely to become State Endangered in the future if current trends in habitat loss or other detrimental factors remain unchanged. In general, taxa with this designation have 3-5 known or estimated populations and are especially vulnerable to habitat loss (Enser, 2007). The plant has a global ranking of G5T5, indicating that the subspecies is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of yellow thistle have been identified within the Project ROW.

5.12.3 Woodland Sunflower

The New England Wildflower Society's website indicates that woodland sunflower is found in meadows and fields, woodlands, and along forest edges (New England Wildflower Society, n.d.). The flowering period is June through September (Lady Bird Johnson Wildflower Center, n.d.).

Woodland sunflower is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While the known occurrences of woodland sunflower have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.4 Hairy Pine-Sap

Hairy pine-sap is similar in appearance to yellow pine-sap (*Hypopitys monotropa*) and they occur in similar habitats The New England Wildflower Society's website indicates that hairy pine-sap is found in forests and woodlands (New England Wildflower Society, n.d.). It is distinguished from yellow pine-sap by its pink or red colored stems.

Hairy pine-sap is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While the known occurrences of woodland sunflower have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.5 Colic-Root or Stargrass

The New England Wildflower Society's website indicates that colic-root or stargrass is found in grassland, meadows and fields, sandplains and barrens, and woodlands (New England Wildflower Society, n.d.). It is considered a facultative species and occurs in both wetlands and uplands. The flowering period is May through August (Lady Bird Johnson Wildflower Center, n.d.).

Colic-root is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While the known occurrences of colic-root have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.6 White-Fringed Bog-Orchid

The New England Wildflower Society's website indicates that white-fringed bog-orchid is found in man-made or disturbed habitats, bogs, fens, meadows and fields, and along the edges of wetlands (New England Wildflower Society, n.d.). It is considered an obligate wetland species and only occurs in wetlands. The flowering period is June through September (Lady Bird Johnson Wildflower Center, n.d.).

White-fringed bog-orchid is listed as a State Threatened species in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of white-fringed bog-orchid have been identified within the Project ROW.

5.12.7 Slimspike Three-Awn or Northern Poverty Grass

Slimspike three-awn is similar in appearance to an introduced variety of the species (*Aristida longespica var. longespica*). However, the only known occurrences of the variety of the species are in Connecticut and Massachusetts. The New England Wildflower Society's website indicates that slimspike three-awn is found in man-made or disturbed habitats, meadows and fields, and woodlands and may also be found on the shores of lakes and rivers (New England Wildflower Society, n.d.). It is considered an obligate upland species and only occurs in upland habitats. The flowering period is July through October (Lady Bird Johnson Wildflower Center, n.d.).

Slimspike three-awn is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5T5, indicating that the subspecies it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of slimspike three-awn have been identified within the Project ROW.

5.12.8 Purple/Arrowfeather Three-Awn or Triple-Awned Grass

The New England Wildflower Society's website indicates that purple/arrowfeather three-awn of triple-awned grass is found in man-made or disturbed habitats, meadows and fields, and woodlands and may also be found on the shores of lakes and rivers (New England Wildflower Society, n.d.). Disturbed habitats that purple three-awn are observed in include fire lanes and trails (New England Wildflower Society, n.d.). It is considered an obligate upland species and only occurs in upland habitats. The flowering period is June through September (Lady Bird Johnson Wildflower Center, n.d.).

Purple three-awn is listed as a State Threatened species in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of purple three-awn have been identified within the Project ROW.

5.12.9 Drum-Heads, Cross-Leaved Milkwort, or Marsh Milkwort

The New England Wildflower Society's website indicates that drum-heads is found in bogs, meadows and fields, shores of rivers and lakes, and swamps (New England Wildflower Society, n.d.). It is considered a facultative wetland species occurring predominantly in wetlands and occasionally in upland habitats. The flowering period is July through September (Lady Bird Johnson Wildflower Center, n.d.).

Drum-heads is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5T4, indicating that the variety of the species is apparently secure throughout its range, though the global status needs review and it may be rare in some parts.

Occurrences of drum-heads have been identified within the Project ROW.

5.12.10 Ditch-Stonecrop

The New England Wildflower Society's website indicates that ditch-stonecrop is found in man-made or disturbed habitats, floodplains of rivers and streams, lakes and ponds, marshes, shores of rivers and lakes, swamps, and wetland margins Wildflower Society, n.d.). It is considered an obligate wetland plant only occurring in wetlands. The flowering period is July through October (Lady Bird Johnson Wildflower Center, n.d.).

Ditch-stonecrop is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While the known occurrences of ditch-stonecrop have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.11 Clearweed, Coolwort, or Richweed

The New England Wildflower Society's website indicates that clearweed is found in floodplains of rivers and streams and forests (Wildflower Society, n.d.). It is considered a facultative wetland plant most often occurring in wetlands but occasionally occurring upland habitats. The flowering period is August through November (Lady Bird Johnson Wildflower Center, n.d.).

Clearweed is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While the known occurrences of clearweed have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.12 Whip Nutsedge

The New England Wildflower Society's website indicates that whip nutsedge is found in meadows and fields, wetland margins, and woodlands (Wildflower Society, n.d.). It is considered a facultative plant most and occurs in both wetlands and upland habitats. The flowering period is June through September (Lady Bird Johnson Wildflower Center, n.d.).

Whip nutsedge is listed as a State Threatened species in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts. Declines of whip nutsedge populations have been attributed to natural succession reducing the number of open, seasonally wet, sandy sites that are its preferred habitat.

Occurrences of whip nutsedge have been identified within the Project ROW.

5.12.13 Purple Screwstem

The New England Wildflower Society's website indicates that purple screwstem is found in man-made or disturbed habitats, bogs, fens, meadows and fields, and swamps (Wildflower Society, n.d.). It is considered an obligate wetland plant only occurring in wetlands. The flowering period is July through September (New York Natural Heritage Program, n.d.).

Purple screwstem is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5T4, indicating that the variety of the species is apparently secure throughout its range, though the global status needs review and it may be rare in some parts.

Occurrences of purple screwstem have been identified within the Project ROW.

5.12.14 Knotroot Foxtail

The New England Wildflower Society's website indicates that knotroot foxtail is found in man-made or disturbed habitats, marshes, and wetland margins (Wildflower Society, n.d.). It is considered a facultative plant occurring in both wetlands and upland habitats. The flowering period is May through June (Magee, 2016).

Knotroot foxtail is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of knotroot foxtail have been identified within the Project ROW.

5.12.15 Crowned Beggar-Ticks

The New England Wildflower Society's website indicates that crowned beggar-ticks is found in man-made or disturbed habitats, meadows and fields, shores of rivers and lakes, and wetland margins (Wildflower Society, n.d.). It is considered an obligate wetland plant occurring only in wetlands. The flowering period is August through October (Lady Bird Johnson Wildflower Center, n.d.).

Crowned beggar-ticks is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

Occurrences of crowned beggar-ticks have been identified within the Project ROW.

5.12.16 Indian Grass

The New England Wildflower Society's website indicates that Indian grass is found in meadows and fields, woodland clearings, grasslands, man-made and disturbed habitats (most often along roadsides), rocky shores of rivers and lakes, and wetland margins (Wildflower Society, n.d.). It is considered an upland plant only occurring in upland habitats. The flowering period is August through October (Lady Bird Johnson Wildflower Center, n.d.).

Indian grass is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While known occurrences of Indian grass have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.17 Eastern Gamagrass

The New England Wildflower Society's website indicates that eastern gamagrass is found in man-made and disturbed habitats, marshes, meadows and fields, and on the shores of rivers and lakes (Wildflower Society, n.d.). It is considered a facultative plant and occurs in both wetlands and upland habitats. The flowering period is April through September (Lady Bird Johnson Wildflower Center, n.d.).

Eastern gamagrass is listed as a species of State Concern in Rhode Island (Enser, 2007). The plant has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While known occurrences of eastern gamagrass have been identified in the Study Area, there is no known occurrence within the Project ROW.

5.12.18 Northern Leopard Frog

Northern leopard frog is similar in appearance to pickerel frog (*Lithobates palustris*) and occur in similar habitats. Northern leopard frog can be distinguished from pickerel frog by its rounded dark spots encircled by a thin light-colored halo distributed irregularly over its back and sides of the body, dull tan to bright green dorsal base, and white unmarked underside (Massachusetts Natural Heritage and Endangered Species Program, 2015). Spots on pickerel frog are rectangular encircled by a thin black halo distributed in two parallel rows down its back, brownish dorsal base, and bright yellow to orange inner things (Massachusetts Natural Heritage and Endangered Species Program, 2015). Northern leopard frog is found in both wetland and upland habitats. Wetland habitats include marshes, wet meadows, and shrub swamps associated with streams, rivers, lakes, and ponds. These habitats are utilized primarily for overwintering and breeding. Upland habitats include upland fields, grasslands, and occasionally in forested areas.

Northern leopard frog hibernates from October to March under the bottoms of rivers and lakes (Birch, n.d.). Breeding occurs in seasonal wetlands and shallow pools from late March to early May. Tadpoles remain in the water for approximately two to three months before completing metamorphosis and leaving the water in July through August (Massachusetts Natural Heritage and Endangered Species Program, 2015).

Northern leopard frog is listed as a species of State Concern in Rhode Island (Enser, 2007). The decline of the species in Rhode Island has been attributed to habitat loss and fragmentation and chytridiomycosis (Birch, n.d.). The lifecycle of northern leopard frog requires migration between wetland and upland habitats. Development has resulted in the loss of connections between these habitat types. Fragmentation has resulted in the increase in road mortalities of northern leopard frog as individuals attempt to crossroads to reach now isolated sources of food and shelter (Birch, n.d.). Chytridiomycosis is a disease caused by infection by the Chytrid fungus (Batrachochytrium dendrobatidis) and is devastating amphibian populations globally. The disease disrupts northern leopard frog's ability to absorb water and breath by causing a thickening of the normally permeable skin (Birch, n.d.).

Northern leopard frog has a global ranking of G5, indicating that it is demonstrably secure throughout its range, though it may be rare in some parts.

While occurrences of northern leopard frog have been identified in the Study Area, there are no known occurrences in the Project ROW. However, preferred habitat types exist within the Project ROW and as a mobile species there is the possibility of northern leopard frog moving into the Project ROW.

5.12.19 Diamondback Terrapin

Northern diamond-backed terrapin is found in estuaries, coves, barrier beaches, tidal flats, and coastal marshes (Gannon, n.d.). Sandy, dry, open-canopy, upland areas adjacent to these waterbodies are required for nesting (Massachusetts Natural Heritage and Endangered Species Program, 2019). Salt marshes are considered critical to the species for overwintering, foraging, and nursery areas (Massachusetts Natural Heritage and Endangered Species Program, 2019). Breeding occurs in late spring with females nesting in early June and July and hatching occurring in last August. Hatchlings may overwinter in the nest until the following May if the climate is unreasonably cold.

Diamondback terrapin is listed as a State Endangered species in Rhode Island. This designation means that it is in imminent danger of extirpation from Rhode Island. Diamondback terrapin has been given this designation as there are only one to two known populations in the state. Declines in its population have been attributed to poaching, overharvest, and habitat loss (Gannon, n.d.).

Diamondback terrapin has a global ranking of G4, indicating that it is apparently secure throughout its range, though its global status requires review and it may be rare in some parts.

While occurrences of diamondback terrapin have been identified in the Study Area, there are no known occurrences in the Project ROW. However, preferred habitat types exist within the Project ROW and as a mobile species there is the possibility of diamondback terrapin moving into or establishing nest within the Project ROW.

5.12.20 Seaside Sparrow

The Cornell Lab of Ornithology's website indicates that seaside sparrow is similar in appearance to and occurs in similar habitats as saltmarsh sparrow (*Ammodramus caudacuta*) and Nelson's sparrow (*Ammodramus nelson*). Seaside sparrow can be distinguished by its large, long, pointed bill, long rounded tail, long legs, and short rounded wings. It has dark grayish brown coloring above, paler coloring with diffuse dark streaking below, a yellowish spot in front of the eye, and a whitish throat broken by dark "moustache" lines on either side. Saltmarsh sparrow is smaller than seaside sparrow and are less gray in color with orange face markings. Nelson's sparrow is smaller with a shorter bill than seaside sparrow and have a pale gray upper back and light brownish yellow eyebrow and whisker marks. Seaside sparrow is found exclusively in tidal saltmarshes and brackish marshes. Nests are established in taller marsh vegetation (6-12 inches above the ground) to prevent tidal flooding. Eggs are incubated for 12-13 days and young leave the nests 9-11 days after hatching (Audubon, n.d.)

Seaside sparrow is listed as a species of State Concern in Rhode Island. Declines in its population have been attributed to runoff of pesticides and other chemicals, ditching of marshes to control insect populations or drain land, and on-going sea level rise which is accelerating the loss of tidal marsh habitats. In Rhode Island, projects to restore seaside sparrow habitat are ongoing in 13 salt marshes. Save the Bay, the Warren Land Conservation Trust, and the Highlander Charter School of Warren have three ongoing projects in salt marsh associated with the Palmer River. These projects are within the Study Area or are crossed by the Project ROW. Coordination with the organizations responsible for these projects is ongoing to reduce construction impacts to restored habitat.

Seaside sparrow has a global ranking of G4, indicating that it is apparently secure throughout its range, though its global status requires review and it may be rare in some parts.

While occurrences of seaside sparrow have been identified in the Study Area, there are no known occurrences in the Project ROW. However, preferred habitat types exist within the Project ROW and as a mobile species there is the possibility of seaside sparrow moving into or establishing nest within the Project ROW.

5.13 Air Quality

The National Ambient Air Quality Standards (NAAQS) were established by the Federal Clean Air Act Amendments (CAAA), and are designed to protect both public health and welfare (EPA NAAQS). Air quality analyses for projects that may impact motor vehicular traffic are required to evaluate their impact on ozone (O3) and carbon monoxide (CO).

Rhode Island developed a State Implementation Plan (SIP) in 1982 to comply with the 1977 CAAA requirements for O3 and CO. While three pollutants, CO, Nitrogen Oxide (NOx), and

Volatile Organic Compounds (VOCs), play a role in O3 formation, the Environmental Protection Agency (EPA) determined in 1980 that SIPs must require the reduction of VOCs as the most effective strategy to achieve the O3 standard. The 1990 CAAA requires states to update their SIPs to evaluate the impact of reducing all three pollutants.

The State of Rhode Island is required by the CAAA to attain the NAAQS "as expeditiously as practicable." In March 2003, the RIDEM submitted the "Rhode Island Attainment Plan for the One-Hour National Ambient Air Quality Standard" to the EPA as a revision to the SIP (RIDEM Office of Air Resources, 2003). The plan demonstrated that Rhode Island would attain the one-hour ozone standard by 2007 (RIDEM Office of Air Resources, 2003). In the Attainment Plan, Rhode Island agreed to submit to EPA by December 31, 2004 a mid-course review demonstrating that Rhode Island remained on track to attain the one-hour standard by 2007 (RIDEM Office of Air Resources, 2003). In December 2004 the RIDEM submitted the "Mid-Course Review of the Rhode Island Attainment Plan for the One-Hour Ozone National Ambient Air Quality Standard" to the EPA which demonstrated that Rhode Island was still on track to attain the one hour standard by 2007 (RIDEM Office of Air, 2004).

The EPA revoked the one-hour standard as of June 15, 2005 and subsequent planning and emissions reduction efforts were required to focus on achieving the more stringent 8-hour standard (EPA, Green Book).

In April 2008 the RIDEM submitted the "Revision of the Rhode Island State Implementation Plan to Address Interstate Transport of Pollutants Affecting Attainment and Maintenance of the 8-Hour Ozone and Fine Particulate Matter (PM2.5) National Ambient Air Quality Standards" to the EPA as a revision to the State's SIP (RIDEM, 2008). In September 2020 the RIDEM submitted the "Certification of Rhode Island State Implementation Plan Adequacy Regarding Clean Air Sections 110(a)(1) and (2) for the 2015 Ozone National Ambient Air Quality Standard" to the EPA as a revision of the State's SIP (RIDEM, 2020). The certification demonstrated that emissions from Rhode Island sources do not contribute significantly to downwind ozone attainment and will not prevent downwind areas from attaining the NAAQS by their required attainment dates (RIDEM, 2020). Based on the findings in this SR, it not anticipated that the proposed Project will have a significant effect on the air quality of downwind areas.

6

Description of Affected Social Environment

The EFSB Rules require a detailed description of all social and environmental characteristics of the proposed site, including the land uses within and proximate to the Project ROW, visual resources in the vicinity of the Project, and the public roadway systems in the area. The proposed Project is within an existing ROW, and TNEC's rights to the Project ROW are by fee ownership or easement in the Towns of Warren and Bristol, Rhode Island (the Host Communities).

As per Sections 45-22.2-2 et seq. of the Rhode Island General Laws, Rhode Island Comprehensive Planning and Land Use Act, all cities and towns are required to adopt and periodically update Local Comprehensive Land Use Plans. In compliance with these requirements, Bristol adopted its Comprehensive Plan Update in January 2017. Warren remains in the process of updating its Plan; therefore, the current Warren Plan (2003) was reviewed for this section and supplemented with current information from the draft Comprehensive Plan Update (June, 2024) where available.

6.1 Population Trends

The total population within the Host Communities decreased between 2000 and 2010 and has increased slightly between 2010 and 2020, as shown in Table 6-1. The Town of Warren is projected to continue a downward trend through 2040, while the population of Bristol is expected to steadily increase through 2040 (Table 6-2). The Host Communities can be characterized as being a mix of suburban and rural areas with a 2020 population that accounted for 3.06 percent of the total State population (Table 6-1).

Table 6-1 - Population Trends, 2000-2020

				Change			
				2000-2010		2010-2020	
Area	**2000**	**2010**	**2020**	**Absolute**	**Percent**	**Absolute**	**Percent**
State of Rhode Island	1,048,319	1,052,567	1,097,379	4,428	0.40%	44,812	4.08%
Bristol	22,469	22,954	22,493	485	2.11%	(461)	(2.05%)
Warren	11,360	10,611	11,147	(749)	(7.06%)	536	4.81%
Host Community Total	33,829	33,565	33,640	(264)	(4.95%)	75	2.76%
Percent of State Populations	3.23%	3.19%	3.06%				

Notes:
* Towns of Warren and Bristol
( ) Negative
Source: R.I. Department of Labor and Training, Labor Market Information Census Data 2000-2010.
U.S. Department of Commerce. 2020 Census of Population: Social and Economic Characteristics of Rhode Island
U.S. Department of Commerce. 2010 Census of Population and Housing: Population and Housing Unit Counts Rhode Island

According to the Rhode Island Statewide Planning population projections, the population of Bristol is projected to remain stable with a population increase by 0.64 percent (145 people) between 2020 and 2030 and Warren's population is projected to decrease by 13.524 percent (1,507 people; Rhode Island Division of Planning, 2013). By 2040 Bristol's population is expected to increase by 0.56 percent from 2020 levels (132) people) and Warren's population is expected to significantly decrease from 2020 levels by 18.52 percent (2,064 people; Rhode Island Division of Planning, 2013).

Table 6-2 - Population Projections, 2020-2040

				Change			
				2020-2030		2030-2040	
Area	**2020**	**2030**	**2040**	**Absolute**	**Percent**	**Absolute**	**Percent**
State of Rhode Island	1,097,379	1,070,677	1,070,104	(26,702)	(2.43%)	(573)	(0.05%)
Bristol	22,493	23,638	23,770	145	0.64%	1,132	0.56
Warren	11,147	9,640	9,083	(1,507)	(13.52%)	(557)	(5.78%)
Host Community Total	33,640	33,278	32,853	(1,362)	(14.16%)	575	(5.22%)
Percent of State Population	3.06%	3.11%	3.07%				

Notes:
* Towns of Warren and Bristol
( ) Negative
Source: Rhode Island Division of Planning, Rhode Island Statewide Planning Program. Rhode Island Population Projections 2010-2040.
U.S. Department of Commerce. 2010 Census of Population and Housing: Population and Housing Unit Counts Rhode Island

6.2 Employment Overview and Labor Force

Recent population growth, urbanization, and a substantial commuter-based population have produced greater demands for and a wider selection of trades and services. According to the Rhode Island Economic Development Corporation (RIEDC), Rhode Island as a whole has enormous growth potential in the health and life science industry due to the emerging biotechnology companies. The health care and social assistance sector is extremely important to Rhode Island employing over 81,000 individuals statewide. Many manufacturers that invest in technologies and workforce training to compete in the global market have corporate or divisional headquarters in Rhode Island. Labor force and employment trends are shown in Table 6-3.

Table 6-3 - Labor Force and Employment Estimates, 2000-2024

	State	Bristol	Warren
2024 (April)			
Labor Force	586,488	12,484	5,994
Resident Employment	564,588	12,097	5,772
Resident Unemployment	21,900	387	222
Unemployment Rate	3.7%	3.1%	3.7%
2020			
Labor Force	570,736	12,031	5,819
Resident Employment	518,282	11,101	5,297
Resident Unemployment	52,454	930	522
Unemployment Rate	9.2%	7.7%	9.0%
2010			
Labor Force	571,505	12,706	5,900
Resident Employment	504,957	11,368	5,234
Resident Unemployment	66,548	1,338	666
Unemployment Rate	11.6%	10.5%	11.3%
2000			
Labor Force	542,524	12,106	6,240
Resident Employment	520,524	11,667	5,986
Resident Unemployment	21,701	439	254
Unemployment Rate	4.0%	3.6%	4.1%
Total Employment Changes 2000-2024	44,064	-817	8

Source: Rhode Island Department of Labor and Training, Labor Force Statistics, Not Seasonally Adjusted, 1976-April 2024
http://www.dlt.ri.gov/lmi/laus/state/seas.htm
Rhode Island Department of Labor and Training, Bristol Labor Force Statistics, Not Seasonally Adjusted, 1990-April 2024.
http://www.dlt.ri.gov/lmi/laus/town/towns.htm
Rhode Island Department of Labor and Training, Warren Labor Force Statistics, Not Seasonally Adjusted, 1990-April 2024.
http://www.dlt.ri.gov/lmi/laus/town/towns.htm

Historically, the leading employment sectors in the Host Communities have been manufacturing and educational services. Manufacturing remains a leading employment sector in the host communities. However, in recent years a general shift from manufacturing employment to the government and accommodation and food services sectors has been observed.

Currently, the manufacturing, educational, and accommodation and food services sectors are the largest source of employment in the Host Communities (see Table 6-4). Government and health care and social services sectors ranked second in the Host Communities. These two categories are predicted to continue to make up the largest employers in the future.

Table 6-4 - Employment by Industry, 2020 and 2023

	Bristol		Warren		Host Communities	% of
	2020	2023	2020	2023	Total (2023)	Total
Agricultural, Forestry, Fishing and Hunting	*	*	*	*	N/A	N/A
Mining	0	0	0	0	0	N/A
Utilities	0	0	0	0	0	N/A
Construction	301	387	136	177	564	5.04%
Manufacturing	779	910	781	818	1,728	15.5%
Wholesale Trade	161	187	122	124	311	2.78%
Retail Trade	562	623	280	329	952	8.52%
Transportation and Warehousing	*	8	*	67	75	0.67%
Information	32	49	27	37	86	0.77%
Finance, Insurance, Real Estate, and Rental and Leasing	176	212	179	168	380	3.40%
Professional and Technical Services	109	216	222	238	454	4.06%
Management of Companies & Enterprises	*	*	*	*	N/A	N/A
Administrative Support & Waste Mgmt.	194	237	135	140	377	3.37%
Government	1,136	1,100	163	170	1,270	11.36%
Educational Services	1,222	1,330	101	143	1,473	13.18%
Other services (except public administration)	274	303	165	195	498	4.45%
Arts, entertainment, & recreation	155	207	43	48	255	2.28%
Accommodation & Food Services	648	961	492	611	1,572	14.06%
Armed forces	N/A	N/A	N/A	N/A	N/A	N/A
Unclassified Establishments	*	0	0	0	N/A	N/A
Health care & social services	673	679	442	505	1,184	10.59%
Total	**6,422**	**7,409**	**3,288**	**3,770**	**11,179**	**100.00%**

Notes: * Some data not available to avoid revealing data of a specific employer

Source: Rhode Island Department of Labor and Training: Quarterly Census of Employment and Wages, City and Town Report – 2023 Annual.
http://www.dlt.ri.gov/lmi/es202/town.htm

Rhode Island Department of Labor and Training: Census of Employment & Wages, City and Town Summary – 2020 Annual

http://www.dlt.ri.gov/lmi/pdf/town10ann.pdf

6.2.1 Municipal Tax Revenue

The Project is not anticipated to directly affect municipal tax revenues for the Towns of Warren and Bristol.

6.3 Land Use

This section describes existing and future land use within the Study Area, and address those features which might be affected by the Project.

6.3.1 Study Area Land Use

As depicted in Figure 6-1, several dominant land uses are present within the Project Area. While the Study Area primarily falls within residential areas, other land uses within the Study Area include agriculture, commercial and services, industrial, and mixed urban.

Residential land use in the Town of Warren is dominated by single family homes; these tend to be built tightly together in the central, southwestern, and southeastern sections of Warren, but the northern and eastern portions, where the Study Area is located, are less dense (Town of Warren, 2024). Most residential development in the Study Area is medium density with lots sized at one to one-quarters of an acre (Town of Warren, 2024). The southern portion of Warren that borders Bristol is primarily zoned as medium-high or medium density (lot sizes of one-quarter of an acre to one acre; Town of Warren, 2024).

Other land uses within the Study Area in Warren include commercial and industrial. Several commercial-zoned parcels are in the central and eastern portions of the Study Area. These commercial areas have been established to serve community and town-wide shopping and service needs (Town of Warren, 2024). Local commercial space is occupied by businesses such as Navigant Credit Union and Ocean State Job Lot. Industrial districts in the Study Area have been established to encourage intensive industrial and business activities with proper safeguards for protecting nearby residential and environmentally sensitive areas (Town of Warren, 2024). The primary industrial areas within the Study Area are an industrial park east and west of Market Street between Brittney Lane and Grove Avenue and an industrial park between Child Street and Franklin Street.

Educational and Institutional facilities within the Study Area include the Highlander Charter School of Warren at 360 Market Street. The Charter School is in the norther portion of the Study Area and is adjacent to the ROW. The Raggedy Ann Nursery School is at 210 Metacom Avenue, approximately 530 feet east of the ROW. The Children’s Workshop – Warren is located at 410 Child Street, approximately 1,000 feet east of the ROW. The Garden Playschool is located at 84 Cutler Street, approximately 1,400 feet west of the ROW. An East Bay Community Action Program Head Start at the Mary V Quirk School is located at 790 Main Street, approximately 2,500 feet west of the ROW. The Learning Journey Preschool and Child Care Corp. is located at 814 Metacom Avenue, approximately 1,400 feet east of the ROW. The George Hail Public Library is located at 530 Main Street, approximately 2,700 feet west of the ROW.

Medical and health facilities within the Study Area include the Bierman Autism Center at 91 Main Street Suite 115, which provides diagnostic and therapy services to children diagnosed with autism. The Center is approximately 1,800 feet northwest of the ROW. The Warren Medical Center is located at 851 Main Street and is occupied by an Aspire Dermatology office and the Warren Family Practice (a member of Charter Care Health Partners). The Warren Medical Center is approximately 2,600 feet west of the ROW. The Metacom Medical Center at 639 Metacom Avenue provides laboratory services and offices for primary care physicians associated with Rhode Island Hospital and Miriam Hospital (both members of Lifespan Physician Group Inc.). The Metacom Medical Center is approximately 1,000 feet east of the ROW. The offices of East Bay

Dental Associates are located at 1052 Main Street and offers routine oral care as well as oral surgery. The offices are approximately 2,200 feet west of the ROW. The Bristol Medical Center, which is part of the Medical Associates of Rhode Island and provides various medical services including dermatology, eye care, internal medicine, laboratory, pediatrics, physical therapy, podiatry, radiology, and walk-in center. This clinic is located at 1180 Hope Street, approximately 3,000 feet west of the ROW. Another facility is Grace Barker Health Place, which is a senior care facility at 54 Barker Avenue and is approximately 2,200 feet west of the ROW.

The Warren Police and Fire Departments are also within the Study Area at 1 Joyce Street. The Warren Fire Department has additional fire stations at 104 Water Street, 342 Metacom Avenue, and 15 Vernon Street as well as a rescue station at 34 Miller Street. The Warren Town Hall, which is houses various municipal departments responsible for the management of the town, is located at 514 Main Street, approximately 2,700 feet east of the ROW. The Warren Housing Authority, which is responsible for providing housing and supportive services for low and moderate-income individuals and families in Warren, is located at 20 Libby Lane, approximately 350 feet east of the ROW.

The Bristol County Water Authority, which is responsible for providing potable water to Bristol County, has an office at 450 Child Street, approximately 1,500 feet east of the ROW.

Residential use in the Town of Bristol is largely composed of single-family dwellings (65 percent of the housing stock; Town of Bristol, 2016). The central portion of Bristol is primarily zoned for medium to high density residential, with lots ranging from one-quarter of an acre to three-eighths of an acre, and industrial (Town of Bristol, 2016). Other land uses within the Study Area in Bristol include open space, general business, and limited business (Town of Bristol, 2016).

The Study Area also encompasses several parcels of open space and agricultural land, detailed below in Section 6.3.3.

6.3.2 Land Use Along the Transmission Line Corridor

The northern end of the ROW begins at the Massachusetts/Rhode Island state line at the north edge of Warren, immediately south and west of the Swansea Country Club and approximately 2,250 feet west of Route 136 (Market Street). The ROW extends southerly through Warren, through freshwater wetlands, salt marsh, forested areas, residential neighborhoods, an agricultural field, and the Warren Driving Range, parallel to the Palmer River. The ROW crosses the Belcher Cove portion of the Palmer River to reach the Warren Substation, and then turns to the east through Jamiel Park, a former landfill, and salt marsh before turning south again. The ROW continues through residential neighborhoods, areas of commercial development, and freshwater wetlands. It then proceeds through Bristol across the Bristol Golf Park and freshwater marsh and shrub swamp associated with Silver Creek, where it terminates at the Bristol Substation at 99 Gooding Avenue in Bristol, Rhode Island. The ROW crosses some open space that has been protected through conservation easements or agricultural preservation land. These properties include Haile Farm Preserve, Sowams Meadows, Belcher’s Cove Preserve, Jamiel Park, Perry-Tavares Farm, and the Bristol Golf Park

6.3.3 Open Space and Recreation

Much of the northern portion of Warren is classified as agricultural land or open space, and, as of 2020, approximately 2,338 acres of land is classified as open space, which amounts to 51 percent of the town's land (Warren Comprehensive Plan, 2024). Bristol has approximately 1,714 acres of land that is classified as open space, recreational land, and agricultural land, which accounts for approximately 13 percent of Bristol's total area. Several areas of open space and recreational land are present within the Study Area and much of it has been conserved through the cooperation of the Warren Land Conservation Trust, the Town of Warren, the Town of Bristol, RIDEM, and private landowners. The Warren Land Conservation Trust is a local non-profit dedicated to conserving land in Warren. The Study Area encompasses the following open space and recreation lands.

6.3.3.1 Warren

Ann Court

The Warren Land Conservation Trust owns this 2.25-acre parcel that is immediately east of Ann Court and west of Barden Lane. It was purchased in 2010 for the purposes of Habitat Protection.

Belcher's Cove

The Warren Land Conservation Trust owns 11.55 acres of salt marsh that borders Belcher's Cove (a segment of the Palmer River). The property is to the west of Palmer Avenue and Connolly Avenue and across the Palmer River to the northeast of the Warren Substation. The Project ROW crosses through the conservation area at its eastern most point. The conservation area is composed of multi-parcels of land acquired by The Warren Land Conservation Trust from local landowners between 1995 and 2000.

Belcher's Cove Pathway

This 3.5-acre property owned by the Town of Warren abuts the East Bay Bike Path to the northeast and Belcher's Cove to the southwest. The property is approximately 500 feet northwest of the Project ROW and Warren Substation. It provides shore access to local residents and bike path users. The Town of Warren acquired the property in 2003 and the pathway was constructed in 2020.

Britto Park

This 24.3-acre property owned by the Town of Warren is south of Kickemuit Middle School and on the eastern bank of the Kickemuit River. The park was established by the town in 1956 for public recreation. The park contains a segment of the Warren Bike Path and a project to connect the bike path to Riverview Street on the western bank of the Kickemuit River is currently underway. Chase Farm +The agricultural development rights of this farmland was purchased by the State of Rhode Island in 1985. This 141-acre property is now protected via agricultural land preservation. It is located immediately east and west of Birch Swamp Road and is approximately 1,900 feet east of the ROW.

Culter Mill Woods

This 6.15-acre parcel located north of a Prime Storage facility at 130 Franklin Street and south of Twigg's Automotive at 205 Child Street is a conservation area owned and managed by the Warren Land Conservation Trust. In 2005, the Warren Land Conservation Trust worked with the property owners to permanently conserve the property for the purposes of habitat protection. The ROW is approximately 550 feet east of Culter Mill Woods.

Haile Farm Preserve

Haile Farm Preserve is a 6.11-acre parcel on the eastern shore of the Palmer river and immediately south of the Swansea Country Club. The parcel was historically farmed between 1682 and 1988. In 2018, the Warren Land Conservation Trust acquired the property from the Haile family. The preserve supports populations of state listed rare, threatened, and endangered species. The ROW crosses portions of the Haile Farm Preserve from existing F184N and E183 Structure Nos. 7 through 12.

Jamiel Park

This 11.4-acre recreational area is owned and managed by the Town of Warren. It is located north of Market Street and south of the Palmer River and contains basketball and tennis courts, a softball field, and skating rink (Town of Warren). A restoration project began in 2003 to mitigate erosion and flooding, improve shoreline access, cap a former landfill, and improve recreational facilities and is still ongoing. The ROW passes through Jamiel Park at its northern extent over the landfill.

Lial Farm/Windswept Farm

The agricultural development rights of this farmland were purchased by the State of Rhode Island in 2015 when it was known as Lial Farm. This 41.23-acre property is now protected via agricultural land preservation. In 2016, the property was sold and the name was changed to Windswept Farm. The farm now functions as an equestrian school and boarding stables. It is immediately west of Serpentine Road and approximately 700 feet north of Route 136. The ROW is approximately 300 feet south of Lial Farm.

Orange and Pennsylvania

This 1.51-acre parcel is approximately 270 feet east of Route 136 and abuts Lial Farm to the west. In 2010, the Warren Land Conservation Trust worked with landowners to permanently conserve the property for the purposes of habitat protection. The ROW is approximately 350 feet south of the Orange and Pennsylvania parcel.

Samuel Place Preserve

This 26.97-acre parcel is on the east side of Route 136 and abuts Chase Farm to the north and west. In 1998, the Warren Land Conservation Trust worked with landowners to permanently conserve the property for the purposes of habitat protection. This property is approximately 1,500 feet east of the ROW.

School House Road

This 11.31-acre parcel is located on the northern side of School House Road to the east of the First Student, Inc. bus yard at 327 Market Street. In 2007, the Warren Land Conservation Trust worked with landowners to permanently conserve the property. The ROW is approximately 1,700 feet west of the property.

Sowams Meadows

This 26.25-acre parcel is located on the western side of Route 136 and the eastern shoreline of the Palmer River. In 2020, the property was gifted to the Warren Land Conservation Trust by the landowner. There is an on-going habitat restoration project on the property that is expected to be completed in 2026. The ROW crosses the property between Structure Nos. 19 and 23.

Swansea Country Club

This 254-acre parcel located just north of the Massachusetts/Rhode Island Boundary is a semi private golf course and country club. Although primarily in Swansea, Massachusetts, approximately 54 acres of the golf course is in Warren. The property is immediately west and north of the ROW.

6.3.3.2 Bristol

Bristol Golf Park

This 24.5-acre parcel is composed of two segments, one south of Tupelo Street and north of Broadcommon Road and the second south of Broadcommon Road. It is a municipal golf course owned by the Town of Bristol. From 2019 to 2021, the Town of Bristol partnered with Save Bristol Harbor, and Save the Bay to restore freshwater wetlands on the Bristol Golf Park. The ROW is within the Bristol Golf Course between existing Structure Nos. 40 through 49.

Bristol Town Woods/Bristol Town Park

These 3.89-acre (Bristol Town Woods) and 6.33-acre (Bristol Town Park) parcels abut one another to the north and south and are approximately 600 feet east of Route 114 and approximately 850 feet north of Gooding Avenue. Both parcels are owned and managed by the Town of Bristol which moved the area into conservation in 1998. The parcels are approximately 1,900 feet west of the ROW.

Claire D. MacIntosh Refuge

This 25.3-acre parcel is on the western side of 114 immediately south of the Bristol/Warren Boundary and extends west to the eastern shoreline of Upper Narragansett Bay. It is owned and maintained by the Audubon Society of Rhode Island which established the refuge after being bequeathed the property from the original owner in 1992. The ROW is approximately 2,300 feet east of the refuge.

Harding Estate

This 0.77-acre parcel is on the western side of Route 114 between the roadway and residences at 1, 3, and 5 Patricia Ann Drive and 2 Dolly Drive. It is owned by the Bristol Land Conservancy Trust who acquired the property in 1988 from landowners and is part of their cluster open space approach to conservation. The ROW is approximately 2,200 feet east of Harding Estate.

Perry-Tavares Farm Open Space

This 103-acre parcel is approximately 360 feet north of Tupelo Street 660 feet south of Ridgeway Drive, immediately east of Elmwood Drive and Terrace Drive and on the western shoulder of Route 136. It is owned by the Town of Bristol which worked with landowners to permanently conserve the property between 2004 and 2016. It is managed by the Town of Bristol Conservation Commission. The ROW crosses the entirety of the property between existing Structure Nos. 31 and 40.

6.3.4 Compatibility with Future Land Use Planning

In order to assess future land use, an analysis of current and future zoning was undertaken. Typically, towns and cities manage future growth through zoning regulations which provide a degree of control over a community. The Study Area is zoned residential, industrial, and open space.

6.3.4.1 Warren

The current land use of the Study Area in Warren consists of conservation/open space, low density, medium-low density, medium density, medium-high, and high density residential land, agriculture, wetland, forest, commercial, industrial and institutional land uses (Town of Warren, 2024). The Warren future land use plan predicts that these uses may change dramatically within the Study Area. The Plan depicts that existing wetlands and forest will be converted to medium and high-density residential land use, and areas of existing medium residential land use will be converted to high density residential land use.

Warren's Comprehensive Plan Natural Hazards and Climate Change Element (2024) establishes the goal to avoid or minimize the effects that natural hazards pose on Warren's residents, businesses, infrastructure, critical facilities, and historic and natural resources. The Natural Hazards and Climate Change Element proposes a policy to protect essential services and critical facilities and utilities from the impacts of natural hazards through proper siting and flood proofing measures and recommends planning "for the protection and/or relocation of at-risk utility infrastructure."

6.3.4.2 Bristol

The most current future land use plan developed by the Town of Bristol is from 2016 (Town of Bristol, 2016). This plan shows that the Study Area contains high and medium density residential land use, open space, agriculture, manufacturing, general business, mixed use (affordable residential and commercial land use), and planned unit development, institutional, and waste disposal. These future uses are consistent with the present use of the Study Area.

A review of Bristol's Comprehensive Plan (2016) contains limited discussion of electrical utilities. There is a provision in the implementation of the economic development strategy (Chapter 5: Economic Development and Agriculture, Statement of Goals and Policies subsection D: Civic Services and Utilities) to plan for upgrading new and traditional utilities as key civic services/infrastructure that is underpinning economic growth (Town of Bristol, 2016).

6.3.4.3 Conclusions

Based on the Towns' similar interests in protecting critical utilities, rebuilding the E183/F184 Feeder Lines will help the towns to achieve their shared objective. By replacing the existing structures and conducting any necessary tree trimming, TNEC will reduce the possibility of a line failure during increasingly severe storms.

6.4 Visual Resources

The visual quality of a place is determined, in part, by the perceived aesthetic value of the available views, as influenced by topography, vegetation, and land use. The existing TNEC ROW extends approximately 5.2 miles from the Massachusetts/Rhode Island Boundary at Warren Rhode Island, to the Bristol Substation at 99 Gooding Avenue in Bristol, Rhode Island. Warren and Bristol are on a peninsula-like landform that is bordered by the Palmer, Warren and

Kickemuit Rivers, Upper Narragansett Bay, Bristol Harbor, and Mt. Hope Bay. The topography in the study area is variable and includes level benches or terraces, saddles and valleys, and sloped ridges and hillsides. Elevations within the study area range from 0 to 140 feet above mean sea level.

Land use in the study area is dominated by developed suburban residential and commercial areas. The residential areas are densely clustered developments of single-family homes that generally range in age and character from early-to-mid-twentieth-century homes to newer subdivisions that feature larger, contemporary-style homes. Major highways within the study area include Rhode Island State Routes 136, 103, and 114. Significant portions of Routes 114 and 136 feature dense commercial development, including gas stations, chain restaurants, and a variety of local businesses. These establishments typically feature low, one- or two-story buildings of eclectic character, many of which are set back from the roadways adjacent to open, paved parking areas. The northern portion of the study area features clustered business parks with larger buildings occupied by offices and light industrial facilities. The southern portion of the study area also features a dense cluster of light industrial facilities around the Bristol Golf Park.

A few large areas of open agricultural land are scattered throughout the study area, primarily within the northern portion. Although a relatively minor component of the study area, these agricultural areas are notable in that they are typically designated as scenic and/or land conservation areas, and offer open, long-distance views of the surrounding landscape. The study area also includes relatively small, scattered patches of forest. Vegetation in forested areas is dominated by deciduous trees, and includes both mature and successional stands. Where forest vegetation occurs in larger, more intact blocks, it provides a strong sense of enclosure and screening along roadways and around residential and commercial areas. Small ponds, wetlands, and streams are scattered throughout the study area, but are typically obscured from direct view by woody vegetation.

A number of resources/sites that could be considered visually sensitive occur within the study area. These include historic sites, areas designated as scenic by RIDEM, conservation/open space areas, schools, cemeteries and waterbodies. State-designated scenic areas within the study area include the Birch Swamp Road Scenic Area and Route 114 and High Street Scenic Byway. Areas of intensive land use in the study area are also considered visually sensitive due to the number of potential viewers. These areas include residential neighborhoods, commercial districts, agricultural land, open space recreation areas, and transportation corridors. Specific viewer groups within the study area include local residents, through-travelers, and visitors.

6.5 Noise

6.5.1 Introduction

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, or recreation. Sound (noise) is described in terms of loudness, frequency, and duration. Loudness is the sound pressure level measured on a logarithmic scale in units of decibels (dB). For community noise impact assessment, sound level frequency characteristics are based upon human hearing, using an A weighted [dB(A)] frequency filter. The A weighted filter is used because it approximates the way humans hear sound. Sound levels are made up of individual components called octave band frequencies. The dB(A) sound levels are weighted to focus on the octave band frequencies that humans hear best. A pure tone condition can occur when a sound can be distinctly heard as a single pitch or set of single pitches. Generally, a 1 or 2 dB(A) increase is not perceptible to the average person. A 3 dB(A) increase is a doubling of acoustic energy, but is just barely perceptible to the human ear. A 10 dB(A) increase is a tenfold increase in acoustic energy, but is perceived as a doubling in loudness to the average person.

Table 6-5 presents a list of common outdoor and indoor sound levels. The duration characteristics of sound account for the time varying nature of sound sources.

Table 6-5 - Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft takeoff at 300 ft	
120	Threshold of feeling	Elevated train	Rock band concert
110	Extremely Loud	Jet flyover at 1000 ft	Inside propeller plane
100	Very Loud	Motorcycle at 25 ft, auto horn at 10 ft, crowd noise at football game	
90	Very Loud	Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40	Quiet	Farm field with light breeze, birdcalls, soft stereo music in residence	Bedroom, average residence (without television and stereo)
30	Very quiet	Quiet residential neighborhood	
20	Very Quiet	Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted from Architectural Acoustics, M. David Egan, 1988 and Architectural Graphic Standards, Ramsey and Sleeper, 1994.

6.5.2 Noise Impact Criteria

The State of Rhode Island does not have regulations that set community noise exposure criteria or abatement measurements. Instead, noise abatement criteria are instituted by the municipalities of Rhode Island. The Project is within Warren and Bristol. Both towns have developed noise impact criteria as follows:

Table 6-6 - Town of Bristol Sound Limit, dB(A)

Zoning District	Time	Sound Limit
Residential	7 AM to 11 PM	60
	11 PM to 7 AM	50
Business Limited and General	7 AM to 11 PM	65
	11PM to 7 AM	55
Waterfront	At all times	65
Commercial Industrial	At all times	70

Source: Table I: Zoning District Noise Standard Maximum Allowable Octave Band Sound Pressure Levels, Code of the Town of Bristol, Rhode Island, Chapter 10 – Environment, Article II - Noise, January 2024.

Table 6-7 - Town of Warren Sound Limit, dB(A)

Receiving Land Use	Time	Sound Limit
Residential	7 AM to 10 PM	65
	10 PM to 7 AM	55
Business (village business, general, waterfront, manufacturing)	At all times	75

Source: Maximum Permissible Sound Levels By Receiving Land Use, Town of Warren, Rhode Island Code of Ordinances, Section 13.23 (A), November 2, 2023.

Both towns have also established regulations on pure tone conditions. The towns require a reduction of 5 dB(A) from the sound limits listed in the above tables if pure tone is created.

6.5.3 Existing Sound Levels

The Project does not include asset replacements of noise generating equipment in substations. The F184N and E183 Lines are not expected to generate sound under normal operating conditions.

6.5.4 Project Sound Levels and Conclusion

Temporary minor construction noise may be generated during normal working hours. Noise impacts are expected to be negligible and would cease once construction was completed. Noise may go beyond normal work hours for tasks that must be completed once started (i.e., concrete pours, line stringing).

6.6 Cultural Resources

Section 106 of the National Historic Preservation Act (36 CFR 800) requires Federal agencies to take into account the effects of their undertakings (funded or permitted) on historic properties. The Rhode Island Historic Preservation Act (RIGL 42-45-1 et seq.) requires a similar review for state and local projects. Because this project will require state and federal permitting both the RIHPHC and Army Corps of Engineers will review the project for any potential effects [as that term is defined at 36 CFR 800.16(i)] on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. TNEC has begun the state review process with RIHPHC and will also be consulting with the USACE.

6.6.1 Rebuilding F184N and E183 Lines

As part of the federal consultation process under Section 106 of the National Historic Preservation Act, TNEC's cultural resource consultant, PAL, initiated a cultural resource due diligence review for the Project in May 2024 to identify historic architectural properties, archeological sites, and other cultural resources within the Project's Area of Potential Effects ("APE"), and to make recommendations regarding consultation with the RIHPHC, office of the State Historic Preservation Officer ("SHPO"), and any appropriate additional cultural resource investigations.

PAL submitted a State Archaeologist's Permit application to the RIHPHC to perform a Phase I archaeological survey for the Project on July 30, 2024, and on August 28, 2024, the RIHPHC issued Permit #24-10 to PAL to conduct the survey. PAL conducted archaeological survey of the Project APE between September and October 2024 and PAL plans to perform the historic architectural property survey in the fourth quarter of 2024. PAL will submit the archaeological and historic architectural survey reporting to the RIHPHC and Tribes in the first half of 2025. TNEC will consult with the USACE and RIHPHC to avoid, minimize, or mitigate any adverse effects that the Project may have on properties potentially eligible, eligible or listed in the National Register. In the event any archeological resources or area of significance to Native American Tribes are identified during the survey, TNEC will develop appropriate avoidance and protection measures in consultation with the USACE, the Tribes, and the RIHPHC, as appropriate.

6.7 Transportation

The transportation needs of the Study Area are served by a network of state and local town roads. The ROW crosses or abuts 15 roads which will be utilized to access the ROW (Table 6-8).

Table 6-8 - Road Names

Road Name	Town
Route 136 (Market Street)	Warren
South Grove Avenue	Warren
Norbert Street	Warren
Wood Street	Warren
Kickemuit Road	Warren
Route 103 (Child Street)	Warren
Franklin Street	Warren
Vernon Street	Warren
Seymour Street	Warren
Fatima Drive	Warren
Ridgeway Drive	Warren
Tupelo Street	Bristol
Broadcommon Road	Bristol
Ballou Boulevard	Bristol
Gooding Avenue	Bristol

6.8 Electric and Magnetic Fields

6.8.1 EMF Introduction

EMF is a term used to describe electric and magnetic fields that are created by voltage (electric field) and electric current (magnetic field). TNEC, like all North American electric utilities, supplies electricity at 60 Hertz (Hz). Therefore, the electric utility system and the equipment connected to it, produce 60-Hz (power-frequency) EMF. These fields can be measured using instruments and can be calculated using a computer model.

Transmission lines (including those along the Project route) are sources of 60-Hz EMF. To characterize the effect of the proposed Project on the existing levels of EMF, Exponent modeled the transmission lines under existing and proposed conditions. The following is a brief description of these phenomena.

Most electricity in North America is transmitted as alternating current (AC) at a frequency of 60 Hz (i.e., it changes direction and magnitude in a continuous cycle that repeats 60 times per second). The fields from these AC sources are commonly referred to as power-frequency or extremely low frequency EMF. The transmission lines (both those presently constructed and the rebuilt lines) along the route of the Project are sources of 60-Hz EMF. Any source of electricity, such as transmission lines, distribution lines, or any device that uses electricity, such as household appliances and equipment in our homes and workplaces, produces both electric fields and magnetic fields.

Electric fields are created by voltage on conductors such as the conductors that compose the transmission lines. The strength of Project-related electric fields in this report is expressed in units of kilovolts per meter (kV/m), which is equal to 1,000 volts per meter (V/m). The strength of an electric field diminishes with increasing distance from the source. In the case of transmission lines, the decrease is typically in proportion to the square of the distance from the conductors, so the electric-field level decreases rapidly with distance. In addition, grounded conductive objects—including fences, trees, shrubbery, and buildings—block electric fields.

Magnetic fields are created by electrical current such as those that flow in transmission line conductors. The strength of Project-related magnetic fields in this report is expressed as magnetic flux density in units of milligauss (mG), where 1 Gauss = 1,000 mG. Magnetic fields, unlike electric fields, are not blocked by most common objects. Similar to electric fields, however, the strength of magnetic fields diminishes with increasing distance from the source. In the case of transmission lines, magnetic fields also generally decrease with distance from the conductors in proportion to the square of that distance.

Magnetic fields differ from electric fields because they depend on the current flowing in a conductor rather than voltage, which produces electrical fields. The demand for electricity can vary during the day, throughout a week, or over the course of months and years. More current will flow in transmission lines with more demand for electricity. As such, the magnetic-field level produced by transmission lines can also vary with demand. Therefore, the level of current flow—expressed in units of amperes—on transmission lines is often expressed as an annual average (a good predictor of the magnetic field on any randomly selected day of the year) and annual peak load (the highest magnetic-field level that might occur for a few hours or days during the year). Forecasted annual average as well as peak current flows were used to model magnetic fields.

6.8.2 EMF Assessment Criteria

Neither the federal government nor the State of Rhode Island have enacted standards for magnetic fields or electric fields from power lines or other sources at power frequencies (i.e., 60 Hz). This report was prepared to address the requirements of the Energy Facility Siting Board (EFSB), which include "data on the anticipated levels of EMF exposure" (EFSB, 2022). An additional EFSB requirement calls for a review of the current independent scientific research pertaining to electromagnetic fields (EMF) and an evaluation of potential health risks associated with this exposure. To comply with this requirement, Exponent prepared a review and evaluation of the current independent scientific research on EMF exposure and human health in a separate report (See Appendix A of this report)[7].

EMF levels in this report were evaluated in the context of relevant health-based exposure limits recommended by scientific organizations. These exposure limits are included in guidelines developed to protect health and safety and are based upon reviews and evaluations of relevant health research. These guidelines include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) to address health and safety issues. The ICES and ICNIRP have each published reference values for exposure to EMF.

The reference values listed in Table 6-9 were used as criteria for the evaluation of Project transmission line designs and the resultant EMF levels.

Table 6-9 - Reference levels for EMF exposure of the public

Electrical Parameter	Reference Level	Agency	Comment
Electric field	4.2 kV/m	ICNIRP (2010)	Whole body exposure to 60-Hz fields: general public
	5 kV/m 10 kV/m*	ICES (2019)	Whole body exposure to 60-Hz fields: general public
Magnetic field	2,000 mG	ICNIRP (2010)	Whole body exposure to 60-Hz fields: general public
	9,040 mG	ICES (2019)	

*This is an exception for persons within transmission line ROWs.

6.8.3 EMF Modeling Configuration

Figure 6-2 below shows the proposed route of the Project, as well as the location of representative cross sections where EMF were modeled. The Project route is represented by three cross sections. The first cross section (XS-01) represents the Project route from the MA/RI state border to the Warren Substation. The second and third cross sections (XS-02 and XS-03) represent the Project route from the Warren Substation to the Bristol Substation. Additional details regarding the modeling configurations are provided below (Table 6-10 and Figure 6-3 to Figure 6-5). Tabular and graphical summaries of calculated fields levels for these cross sections are shown in Section 7.16 of this report.

[7] Status of Research on Extremely Low Frequency Electric and Magnetic Fields and Health, January 2022 through April 2024; March 19, 2025, prepared by Exponent.

Table 6-10 - Loading summary of transmission lines

		Existing		Proposed (post-construction)		Proposed (5 Years beyond Post-construction)	
		Average	Peak	Average	Peak	Average	Peak
Circuit	Voltage (kV)	MVA	MVA	MVA	MVA	MVA	MVA
E183-3	115	16.7	37.5	20.5	37.0	22.6	35.3
F184N-4	115	7.5	23.3	11.2	21.7	12.6	18.7
F184N-5	115	6.4	13.8	8.3	15.4	9.0	13.6

6.8.4 EMF Modeling Configuration

Where two AC transmission line circuits are on the same ROW, the specific arrangement of the conductors of each circuit will affect the calculated levels of EMF. Therefore, all possible phasing configurations of the F184N-4 and E183-3 lines on the ROW were analyzed to identify the particular phasing that minimizes the magnetic-field at either ROW edge along the Project route. Phase optimization is recognized as one way to minimize EMF levels using low-cost measures (WHO, 2007). The existing phase configuration and the post-project optimized phase configuration of the Project are shown below in Figure 6-2 to Figure 6-4 (for XS-01 to XS-03, respectively).

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7

Impact Analysis

This chapter presents an analysis of the potential impacts of the Project on existing environmental and social conditions within the Study Area. As with any construction project, potential adverse impacts can be associated with the construction, operation or maintenance of an electric transmission line or substation. These impacts will be minimized by the careful location of structures, facilities and access roads, and by the adoption of numerous mitigation practices.

This Project will be constructed in a manner that minimizes the potential for adverse environmental impacts. A monitoring program will be conducted by TNEC to ensure that the Project is constructed in compliance with relevant licenses and permits and applicable federal, state, and local laws and regulations. Design and construction mitigation measures will ensure that construction related environmental impacts are minimized.

7.1 Geology

The Project will have negligible impact on the bedrock and surficial geologic resources of the Project ROW. The Project ROW consists of lodgement till in the southern portion, glaciofluvial deposits in the northern portion, and organic deposits associated with wetland areas.

If bedrock is encountered at or below the surface and it is sufficiently stable and unfractured, those structures requiring caisson foundations may be anchored directly to the bedrock which will serve as the footing for those structures. If the bedrock is inadequate as a pole footing, it will be drilled or hammered to the required depth and a concrete footing will be prepared, or the pole set and backfilled with clean granular material.

7.2 Soils

Construction activities which expose unprotected soils have the potential to increase natural erosion and sedimentation rates. Soil compaction and decreased infiltration rates may result from equipment operations. Minor grading may be necessary to improve existing access roads and/or prepare a work site for structure construction in uplands. Standard TNEC construction techniques and BMPs such as the installation of compost filter sock (CFS), siltation fencing, the re-establishment of vegetation and dust control measures, will be employed to minimize any short- or long-term effects due to construction activity. These devices will be inspected by the environmental monitor frequently during construction and supplemented, repaired or replaced when needed. TNEC will develop and implement a Soil Erosion and Sediment Control (SESC) Plan which will detail BMPs and inspection protocols.

Excess soil from excavation at pole structures in uplands will be spread around the poles and stabilized to prevent migration to wetland areas. Excess material excavated from pole structure locations in wetlands will be spread at upland sites. Topsoil will then be spread over the excess excavated subsoil material in uplands and seeded and mulched to promote rapid revegetation and stabilization. Where feasible, wetland soils will be returned to the excavated area and smoothed to match adjacent grade.

Potentially highly erodible soils are within the Project ROW. However, on all slopes greater than eight percent and outside of wetland or other sensitive areas, disturbed soils will be stabilized with hay or chipped brush mulch to prevent the migration of sediments.

The Project ROW crosses several areas of prime farmland soils. The majority of these areas are not being managed in active agriculture, rather they are currently occupied by residential, commercial and industrial development, and open space/recreation. In addition, the Project crosses three areas of Farmland of Statewide Importance. These areas are mapped as Stissing (a hydric soil unit), Walpole (a hydric soil unit), and Windsor (a nonhydric soil unit) soils. Stissing and Walpole are generally consistent with the presence of freshwater wetlands. Forty-two structures will be in areas mapped as prime farmland soils.

7.3 Surface Water

Any impact of the Project upon surface watercourses will be minor and temporary. Construction activities temporarily increase risks for erosion and sedimentation that may temporarily degrade existing water quality; however, appropriate BMPs will be implemented and maintained to effectively control sediment. In addition, construction equipment will not cross rivers and streams along the construction corridor without the use of temporary mat bridges or other crossing structures. Emphasis has been placed on utilizing existing gravel roadways within the ROW and seeking access points that avoid crossing wetlands and surface waters.

The major surface water features within the Project ROW include the Palmer River, Unnamed Tributary to Palmer River 1, Unnamed Tributary to Palmer River 2, Unnamed Pond 7, Unnamed Pond 8, Unnamed Pond 9, and Silver Creek. Construction mats will be used to access structure locations within or adjacent to surface water features as conditions warrant. Access to most structure locations adjacent to these watercourses will be provided without impacting the channels either by using alternate upland access on the ROW or by spanning the areas using temporary wooden mats during construction. Sedimentation and erosion within these watercourses will be minimized through the implementation of BMPs prior to construction activities.

Potential impacts to surface waters if sediment transport is not controlled include increased sedimentation (locally and downstream) and subsequent alterations of benthic substrates, decreases in primary production and dissolved oxygen concentrations, releases of toxic substances and/or nutrients from sediments, and destruction of benthic invertebrates. Erosion and sedimentation controls will effectively minimize the potential for these outcomes to occur. The implementation and maintenance of stringent erosion and sedimentation control BMPs will limit the levels of Project related sedimentation and will minimize adverse impacts to surface waters.

7.3.1 Water Quality

The primary potential impact to water quality from any major construction project is the increase in turbidity of surface waters in the vicinity of construction resulting from soil erosion and sedimentation from the disturbed site. A second potential impact is the spillage of petroleum or other chemical products near waterways. Disturbance to previously undisturbed areas on the ROW will be minimized through the use of existing roadways. Overhead transmission line construction requires only a minimal disturbance of soil for pole foundation excavation. Furthermore, equipment will not be refueled or maintained near wetland or surface water resources. Therefore, it is anticipated that any adverse impacts to water resources resulting from construction of the proposed transmission line will be negligible.

The removal of vegetation prior to construction may result in increased erosion potential so that slightly higher than normal sediment yields may be delivered to area streams and wetlands during a heavy rainfall. However, these short-term impacts would be minor as a result of the relatively small area to be disturbed, the use of selective tree removals within 25 feet of streams, the implementation of erosion control measures and the short duration of construction activities. In addition, a detailed SESC Plan will be designed and implemented which will confine sediment within the immediate construction area and minimize impacts to downstream areas.

7.3.2 Hydrology

Some minor, temporary impacts to surface drainage may be expected during construction and maintenance of the transmission lines. These impacts will be associated with access road improvements and installation of the pole structures. Following construction, the topography within the work corridor will generally be restored to its pre-construction contours with the exception of structure pads and permanent access roads.

The hydrology of surface waters will not be significantly affected during or after construction since temporary wooden mat bridges will be constructed across stream channels as needed to allow for the passage of construction equipment without disturbing the stream or its channel substrate. These bridges will be removed following construction. A slightly higher rate of storm water runoff may result from the mowing of vegetation which would otherwise function to absorb some of the precipitation and slow the rate of runoff. These impacts will be short-term because vegetative cover will quickly reestablish in the construction corridor following construction.

7.3.3 Floodplain

Based on available FEMA mapping, the northern portion of the Project ROW in Warren is within Coastal SFHA associated with the Kickemuit Reservoir, Kickemuit River, Palmer River, and Warren River. The one percent annual chance coastal flood represents the extent of flooding that would result during a storm event having a one percent chance of occurring per year.

Seventy of the 105 proposed replacement structures will be within Coastal SFHA.

7.4 Groundwater

As discussed below, any impact of the Project upon groundwater resources will be minor.

7.4.1 Transmission Lines

Potential impacts to groundwater resources within the Project ROW as a result of construction activity will be negligible. Equipment used for the construction of the transmission line will be properly maintained and operated to reduce the chances of spill occurrences of petroleum products. Refueling of equipment will be conducted in upland areas. Refueling equipment will be required to carry spill containment and prevention devices (i.e., absorbent pads, clean up rags, five-gallon containers, absorbent material, etc.) at all times. In addition, maintenance equipment and replacement parts for construction equipment will be on hand to repair failures and stop a spill in the event of equipment malfunction. Following construction, the normal operation and maintenance of the transmission line facility will pose no threat to groundwater resources.

7.5 Vegetation

Minimal impacts to vegetation will occur along segments of the F184N-4&5 and E183-3 Lines. Vegetation within the ROW work areas will be mown. Vegetation maintenance in sensitive resource areas will be accomplished with hand tools or will be avoided to the greatest extent possible. Tree clearing west of the Warren Substation is required to establish the required clearance between the reconfigured F184N-4/5 and E183 Tap Lines and vegetation. Approximately 22,650 SF of fringe woodland will be cleared including approximately 1,791 SF of freshwater wetland. Incidental side-line tree removal may be required where “danger trees” are present along the ROW. Following construction, disturbed areas will be seeded and mulched.

A well managed ROW is required to maintain the reliability of the transmission system. Following construction, vegetation management is necessary to prevent trees and other tall woody species from growing into or falling into the lines. Dense woody vegetation also restricts visual and physical access which is necessary for inspection, repair and maintenance of the transmission lines.

TNEC manages vegetation on its ROWs through integrated procedures combining removal of danger trees, hand cutting, targeted herbicide use, mowing, selective trimming and side trimming. Three methods of targeted herbicide treatments are utilized: basal application, cut stump treatment, and foliar application.

The appropriate method of vegetation management is chosen by a TNEC forester or arborist in accordance with TNEC’s vegetation management policy. The typical maintenance cycle for this ROW is four years, although occasionally site specific conditions may require a shorter cycle. Any permits necessary for vegetation management operations are obtained prior to the initiation of management procedures.

7.6 Wetlands

Construction of the Project will result in temporary and permanent impacts to wetland resources. The following sections describe the impacts associated with construction of the Project including vegetation clearing, excavation for pole structures, and access road construction.

7.6.1 Vegetation Management

Vegetation mowing will occur within state-regulated contiguous and buffer areas to facilitate construction and maintenance of the F184N and E183 Lines. Approximately 0.5 acres of tree clearing will be necessary for the reconfiguration of the E183-3 and F184N-4/5 Tap Lines into Warren Substation of which approximately 1,791 SF is within state- and federal-regulated Palustrine Wetland and 20, 859 SF is within state- regulated 200-foot Contiguous Area. Appropriate erosion and sediment control measures will minimize impacts to wetlands from adjacent disturbed areas.

7.6.2 Access Roads

Following the delineation of wetland boundaries within the 5.2-mile Project ROW, a site inspection was conducted to determine access to pole structures which would minimize impacts to wetland areas. Access road routes have been chosen to avoid wetlands completely, to cross wetlands at previously impacted locations or to traverse the edges of wetlands. Temporary crossings using timber construction mats will be used in wetlands.

In upland areas of the Project ROW access roads will be maintained and refreshed with crushed stone. Temporary construction mat access roads will be utilized in areas supporting sensitive uses such as maintained residential lawns, golf courses, and agricultural fields. Following the completion of the Project, the crushed stone access roads will be permanently stabilized with topsoil, a native conservation seed mix, and straw mulch.

7.6.3 Structures

Under the current design of the proposed transmission facilities, engineering and safety requirements necessitate the replacement of 105 structures. Many of these structures are within state and federal regulated resource areas including;

- Coastal Wetland: 37 structures
- Freshwater Wetland: 17 structures
- 200-ft Contiguous Area/Buffer Zone: 29 structures.

Replacement structures will be directly embedded or installed on concrete caisson foundations in close proximity to the location of existing structures and will require some amounts of fill. Directly embedded structures would require an approximate footprint of 19.6 SF per structure (assuming an average five-foot diameter for 20 structures). Replacement corner structures and some replacement structures in wetland will be installed on concrete caisson foundations. The concrete caisson foundations were designed to accommodate line strain and loading and differ in size depending on location and these variables, and will include 7′, 8′ and 10′ diameter foundations. The surface area of each foundation size are as follows: 7′ diameter: 38.5 SF; 8′

diameter: 50.25 SF, 10' diameter: 78.5 SF. Cumulatively, approximately 2,177 SF of permanent impact is anticipated in state- and/or federal-regulated wetlands.

7.7 Wildlife

During construction, temporary displacement of wildlife may occur due to disturbance associated with ROW clearing and the operation of construction equipment. Wildlife currently utilizing the forested edge of the cleared ROW may be affected by the construction of the Project. Larger, more mobile species, such as eastern white-tailed deer or red fox, will leave the construction area. Individuals of some bird species will also be temporarily displaced. Depending on the time of year of these operations, this displacement could impact breeding and nesting activities.

Smaller and less mobile animals such as small mammals, reptiles, and amphibians may be affected during vegetation clearing and the transmission line construction. The species affected during the construction of the transmission line are expected to be limited in number. Effects will be localized to the immediate area of construction around structure locations and along existing access roads. However, this is anticipated to be a temporary impact as existing wildlife utilization patterns are expected to resume during the operational phase of the Project.

Impacts to sensitive habitats of rare, threatened or endangered species will be avoided through careful project planning, which has involved a detailed ROW inventory, an evaluation of avoidance, minimization, and mitigation of potential impacts, and coordination with RIDEM and the Warren Land Conservation Trust. Impacts to rare, threatened or endangered species will be considered as part of the CRMC permit process.

7.8 Social and Economic Impacts

Based on the proposed location of the Project, the greatest potential for social impact is the interaction of construction on current and future land uses abutting the ROW.

7.8.1 Social Impacts

The Project will enable TNEC to continue to provide reliable electric services to homes, business and industry throughout Warren and Bristol. The proposed Project does not require, nor will it lead to residential or business displacement. Temporary construction impacts, primarily related to construction traffic and equipment operation are expected to be minor; however, the Project will not adversely impact the overall social and economic condition of the Study Area. As described in Section 3.0, the Rebuild Project will be entirely within the existing E183-3 and F184N-4/5 ROWs presently serving Warren and Bristol. Therefore, the Project will not require the acquisition of property or disrupt orderly planned development, thus avoiding adverse impacts.

In order to minimize social impacts, TNEC has engaged in outreach as described in Section 3.4. TNEC will continue its outreach activities during the construction phase of the Project and will continue to address concerns that are raised by abutters.

7.8.2 Population

Project construction and maintenance will have no impact on the population but will improve existing electrical service reliability to the population throughout Warren and Bristol. It will also assure continued capability to serve residential, commercial and industrial developments planned for the future.

7.8.3 Employment

The construction of the Project is not anticipated to directly affect the area economy. Project expenditures may have a small spin-off impact as funds are recirculated and spent within the local economy. By meeting the current and projected demands for increased power in the area, the construction of the Project will support the state's effort to stimulate additional growth and economic activity in the region.

7.9 Land Use and Recreation

The following discussion addresses the compatibility of the proposed transmission line with various land uses along the proposed route.

7.9.1 Land Use

Land use impacts can be separated into short-term and long-term impacts. Short-term land use impacts may occur during the construction phase of the proposed Project. Impacts associated with the construction phase of the Project will be temporary, and most present land uses within the existing ROW could resume following construction. TNEC will provide notification of the intended construction plan and schedule to affected abutters so that the effect of any temporary disruptions may be minimized.

The Project is proposed entirely within an existing ROW, which is already occupied by electric transmission lines. The reconstruction of the transmission lines within the existing ROW will be consistent with the established land use and therefore will not present long-term land use impacts. Proposed reconfiguration of the Warren Substation Taps is limited to a TNEC owned parcel already developed with a substation and the existing transmission taps.

7.9.1.1 Residential

Residential areas are in proximity to the ROW and the Warren Substation. In many locations, existing vegetation will continue to provide visual screening of the facilities from residences. Because the proposed replacement transmission line already occupied by electrical transmission lines, the Project will not displace any existing residential uses, nor will it adversely affect any future development proposals.

7.9.1.2 Agriculture

The proposed Project crosses one area which is presently in agricultural use. Impacts to agricultural uses will occur temporarily as a result of the proposed Project construction but will be limited to the footprints of the transmission line structures and temporary construction mat work pads and access roads. Once construction has bene completed, agricultural use will be restored to its pre-project extent.

7.9.1.3 Educational Institutions

Educational facilities within the Study Area include Highlander Charter School of Warren at 360 Market Street, the Raggedy Ann Nursery School at 210 Metacom Avenue, the Children's Workshop at 410 Child Street, the Garden Playschool at 84 Cutler Street, an East Bay Community Action Head Start at 790 Main Street, and the Learning Journey Preschool and Child Care Corp. at 814 Metacom Avenue. All facilities, with the exception of Highlander Charter School of Warren, are between 530 and 2500 feet from the Project. Accordingly, no impacts to these facilities are expected.

The Highlander School of Warren is adjacent to the Project ROW to the east. An existing access road from the Highlander School parking lot will be utilized to access segments of the Project ROW in Warren. Following completion of the Project, the access road and any disturbed areas will be restored.

7.9.1.4 Commercial and Industrial

The proposed ROW crosses several business areas. These businesses include industrial, commercial, retail, office, recreational and agricultural uses. Normal business operations will not be adversely affected by the Project. No displacement of business will result from the Project.

7.9.2 Recreation

No existing recreational uses will be displaced by the Project.

Impacts to existing parks and recreational areas from the rebuilt electric transmission line will be minimal and short-term. Since the Project is within an existing electric transmission line ROW, potential long-term impacts will be avoided.

7.9.3 Consistency with Local Planning

As documented in the Purpose and Need section of this SR, there is a clear need rebuild the transmission lines to improve the electrical reliability to the area. The Towns of Warren and Bristol have Comprehensive Plans which describe the municipal plans and goals regarding future development and growth in each community. Each municipality's Comprehensive Plan was evaluated with regard to expressed town-wide goals. The proposed Project was then evaluated for consistency with the local planning initiatives in each community.

Because the proposed Project will use existing ROW, it will not alter existing land use patterns and will not adversely impact future planned development. The Project will provide an adequate reliable supply of electricity to support the growth and development envisioned by the Comprehensive Plans of the communities in Project area.

7.10 Visual Resources

The Project will include replacement of the supporting structures and overhead wire. Structures will be replaced along the same alignment and in roughly the same locations. The majority of structures to be replaced are existing wood H-frame structures that will be replaced with steel davit arm structures. Due to clearance requirements associated with the reconductored transmission lines, the replacement structures will range from 20 to 50 feet taller than the existing.

The proposed replacement transmission lines and supporting structures will be somewhat more visible than the existing transmission lines. This is due to their greater height and visual mass, when compared to the existing lines. However, their visual impact is substantially mitigated through the use of the existing transmission line ROWs for the proposed structures, and the fact that additional tree clearing is not required along the majority of the ROW. Tree clearing will be required to accommodate the reconfigured taps at the Warren Substation, approximately 22,650 SF of fringe woodland are proposed to be cleared. No grubbing will be needed and the ROW areas cleared of trees will be managed to promote the establishment of shrubs. An approximately 50-foot natural woodland buffer would remain between the Bike Path and the reconfigured Taps west of the Warren Substation. Visual impacts to the bike path are expected to be minimal and could be mitigated by proposed evergreen vegetation screening plantings between the Warren Substation/reconfigured taps and the East Bay Bike Path if needed.

The combined effect of vegetation (forest areas, street trees, and yard vegetation) and buildings throughout the study area screen (or partially screen) views of the Project from many locations. In the northern portion of the study area open views of the existing lines and structures were available in agricultural and open space recreational areas crossed by the ROW. There are fewer residential and commercial developments abutting the northern portion of the Project ROW than the central and southern portions. Beyond the direct abutting properties, the neighboring commercial and residential properties are screened by vegetation and buildings in the northern portion of Project ROW. Several roads off of Market Street end at the edge of the salt marsh and have open views to the ROW but are limited to the residences and commercial buildings immediately abutting the salt marsh. In the central and in the majority of the southern portion of the study area, the existing lines and structures were visible from streets and yards immediately adjacent to the Project ROW, including subdivisions where houses have been built in close proximity to the line. Near the southern terminus of the Project ROW, the F184 line is within the Bristol Municipal Golf Course and open views of the existing line and structures are available throughout the course. The Bristol Municipal Golf Course is surrounded to the east and west by industrial development including structures two to three stories in height as well as two salvage yards and an excavation company laydown/material staging area. In developed areas more than approximately 0.25-mile from the Project, the combination of screening provided by buildings, trees, and other vegetation in yards and along roadsides effectively obscured views toward the Project site.

In most instances, views of the landscape already include the existing Transmission Lines. As a result, the proposed Project's contrast with the existing visual character of the area will generally be limited. However, due to the increase in size of the proposed transmission structures the Project will be more visible and/or perceived as being more visually prominent from some locations.

Siting of the proposed lines within an existing transmission corridor significantly reduces adverse visual impacts by avoiding the need for additional ROW clearing and minimizing perceived change in land use. The natural brown color of the self–weathering steel poles generally blends well with background vegetation, but contrasts with the sky, especially when viewed at foreground distances. TNEC is proposing new galvanized steel structures to reduce color contrast and visual mass of the structures along stretches of the line where structures are close to viewers and viewed primarily against the sky (e.g., where the lines pass directly through residential neighborhoods).

7.11 Noise

7.11.1 Transmission Line

The proposed transmission lines will not generate an audible sound level under normal operating conditions. As a result, the existing ambient noise levels will not be altered by the upgrade of the F184N-4&5 and E183-3 Lines.

7.11.2 Construction Noise

Temporary noise impacts may occur during construction of the Project. Proper mufflers will be required to control noise levels generated by construction equipment. Typical construction work hours for the Project will be 7:00 a.m. to 7:00 p.m. Monday through Friday when daylight permits and 7:00 a.m. to 5:00 p.m. on Saturdays. Some exceptions to these standard hours are described below. Some work tasks, such as work in tidal wetland areas susceptible to above normal high tides, concrete pours and transmission line stringing, once started, must be continued through to completion and may go beyond normal work hours. In addition, the nature of transmission line construction requires line outages for certain procedures such as transmission line connections, equipment cutovers, or stringing under or over other transmission lines. These outages are dictated by the system operator, ISO-NE, and can be very limited based on regional system load and weather conditions. Work requiring scheduled outages and crossings of certain transportation and utility corridors may need to be performed on a limited basis outside of normal work hours, including Sundays and holidays. If needed, TNEC will seek relief from the construction work hour restriction within the respective towns.

7.12 Transportation

The construction related traffic increase will be small relative to total traffic volume on public roads in the area. In addition, it will be intermittent, temporary, and will cease once construction of the Project is completed. The addition of this traffic for the limited periods of time is not expected to result in any additional congestion or change in operating conditions along any of the roadways along the ROW.

TNEC's contractor will coordinate closely with the municipalities to develop acceptable traffic management plans for work within public rights-of-way. Where access to the ROW intersects a public way, the contractor will follow a pre-approved work zone traffic control plan and, where appropriate, police details. The volume of traffic entering and exiting the ROW at these locations is expected to be small. Vehicles entering and exiting the site will do so safely and with minimal disruption to traffic along the public way. Following construction, traffic activity will be minimal and will occur only when the ROW or transmission lines have to be maintained. As a result, the construction and operation of the transmission line will have minimal impact on the traffic of the surrounding area roadways.

7.13 Cultural Resources

7.13.1 Rebuilding the F184N-4&5 and E183-3 Lines

TNEC's cultural resource consultant, PAL, conducted archaeological survey between September and October 2024. PAL will submit a report on the Phase I archaeological survey to the RIHPHC, the Narragansett Indian Tribe, the Mashpee Wampanoag Tribe, and the Wampanoag Tribe of Gay Hear (Aquinnah) in the fourth quarter of 2024. PAL will develop an archaeological avoidance and protection plan to mitigate any effects construction will have to archeological resources that are recommended potentially eligible and will submit it with the Phase I archaeological report.

Pal plans to perform the historic architectural property survey for the Project in the fourth quarter of 2024. The results will be submitted in the first quarter of 2025.

7.14 Air Quality

7.14.1 Construction Impacts

Exposed soils will be wetted and stabilized as necessary to suppress dust generation, and crushed stone aprons will be used at all access road entrances to public roadways, consequently fugitive dust emissions will be low. In addition, minimal quantities of earth will be moved or disturbed during construction. Therefore, any impacts from fugitive dust particles will be of short duration and localized.

Due to the transitory nature of the construction, air quality in the Project ROW will not be significantly affected by construction along the ROW. Emissions produced by the operation of construction machinery (nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter) are short-term and not generally considered significant.

7.14.2 Operation Impacts

In part, air quality is a function of area wide emissions of ozone precursors (carbon monoxide, nitrogen oxide, and volatile organic compounds) from the change in daily traffic volumes along lengths of area roadways. The Project itself will not generate air emissions. The Project will not change traffic and emissions parameters, nor affect the travel characteristics of the vehicles traveling in Warren and Bristol, Rhode Island. Therefore, the mobile source emissions will not be changed due to the proposed Project.

7.15 Safety and Public Health

Because the proposed facilities will be designed, built and maintained in accordance with the standards and codes as described in Section 3.4, the public health and safety will be protected.

A discussion of the current status of the health research related to exposure to EMFs is attached in Appendix A. This report was prepared by Exponent Health Sciences.

7.16 Electric and Magnetic Fields

7.16.1 EMF Summary

EMF calculations were performed using methods accepted within the scientific and engineering community and that have been found to match well with measured values. All calculated EMF levels at either average or peak loading for existing and proposed configurations are far below reference levels for the general public published by ICNIRP and ICES.

At both average and peak loading, EMF levels at the ROW edges were calculated to decrease or not significantly change as a result of the Project rebuild. The ROW-edge electric-field and magnetic-field levels after construction were calculated to not exceed 0.2 kV/m and 2.7 mG (at average loading), respectively. At peak loading, magnetic-field levels at the ROW edges were calculated to not exceed 4.2 mG at 5 years post-construction at all ROW edge locations as a result of the Project. Similarly, electric-field levels at the ROW edges decrease by up to 0.2 kV/m or increase by no more than 0.1 kV/m. All calculated EMF levels at all locations on the ROW and beyond are far below the guidelines of international scientific and health agencies for electric fields (4.2 kV/m or greater) and magnetic fields (2,000 mG or greater).

7.16.2 Calculation Methods

EMF levels were calculated based on transmission line data such as the configuration and loading of existing and proposed circuits including voltage, current flow, and conductor configurations and phasing. EMF were calculated for both existing and proposed conditions (post-construction and 5 years beyond post-construction). In addition, since magnetic-field levels depend on electrical load flow (i.e., electrical current), they were modeled for both existing and proposed conditions at annual average and peak loading. The current of all transmission lines were assumed to be in phase. The circuit loadings, in units of mega-volt-amperes (MVA), for both annual average- and peak-load conditions are summarized in Section 6.8, Table 6-10 of this report.

Calculations were performed using algorithms developed by the Bonneville Power Administration (BPA), an agency of the U.S. Department of Energy, for modeling AC transmission lines (BPA, 1991). BPA's algorithms utilize simplifying assumptions about the transmission lines to yield conservative results. Measurement evaluations by Chartier and Dickson (1990) and Perrin et al., (1991) have shown that BPA's algorithms accurately predict EMF levels from AC transmission lines. BPA's simplifying assumptions include:

- All conductors are assumed to be parallel to one another and of infinite length;
- The conductors are located at a fixed height above an infinite flat terrain; and
- Conductors are located at the point of lowest clearance above ground.

In actual field conditions, the height of the conductors above ground depends on the sag of the conductors between structures and on the variation of the terrain below, so conductor height above ground will vary at different locations along the transmission line. However, since the conductors will be higher above ground than the assumed lowest clearance height used in calculations, the calculated EMF levels will be conservatively overestimated.

All EMF calculations are reported along a transect perpendicular to the transmission line's centerline and reported at a height of 1 meter (3.28 feet) above ground in accordance with IEEE Standard 644-2019 (IEEE, 2019). EMF levels are reported as the root mean square of the sum of the squares of three orthogonal field components.

7.16.3 Results and Discussion

The calculated existing (pre-construction) and proposed (up to five years post-construction) EMF levels are discussed below for the three representative cross sections (XS-01 to XS-03) of the Project route. Calculated magnetic-field levels for average and peak loading conditions for the three cross sections (pre-construction, post-construction and five years post-construction) are presented below in Table 7-1 and Table 7-2, respectively. Table 7-3 below summarizes calculated electric-field levels. Calculated field profiles for the representative cross sections are provided in Figure 7-1 to Figure 7-3 for the magnetic field at average loading conditions and Figure 7-4 to Figure 7-6 for the electric field.

Magnetic Fields

The calculated magnetic-field levels for all Project configurations are far below the ICNIRP Reference Level of 2,000 mG and the ICES Exposure Reference Level of 9,040 mG for the general public across the ROW for the entire Project route. Along the western ROW edge and immediately after construction, the magnetic-field levels were calculated to be 4.4 mG or less (average and peak loading), decreasing from existing levels by as much as 5.1 mG or not increasing by more than 0.2 mG as a result of the Project. At 5 years post-construction, based on anticipated changes to loading on the transmission lines (summarized in Section 6.8, Table 6-10), magnetic-field levels at the western ROW edge were calculated to be 4.2 mG or less (average or peak loading).

At the eastern ROW edge, the magnetic-field levels after construction were calculated to be 2.1 mG or less (average and peak loading), decreasing by up to 3.6 mG or not increasing by more than 0.3 mG compared with existing levels. At 5 years post-construction, the maximum calculated magnetic-field level at the eastern ROW edge was 1.9 mG (average or peak loading).

The maximum magnetic-field level anywhere on the at average loading ROW was calculated to decrease from 20 mG (existing) to 12 mG (5 years post-construction). At either ROW edge the maximum magnetic-field level at average loading was calculated to decrease from 4.0 mG (existing) to 2.7 mG (5 years post-construction). Similarly, at peak loading the magnetic-field levels at either ROW edge were calculated to decrease from 9.5 mG (existing) to 4.2 mG (5 years post-construction).

Magnetic-field levels also decrease quickly with distance and at 100 feet from the ROW edges, with calculated magnetic-field levels being 1.7 mG or less for existing and proposed conditions along the entire Project route. Magnetic-field levels along the entire Project route for all configurations and loading levels were calculated to be about 2.5% or less of the ICNIRP (2,000 mG) or ICES (9,040 mG) limits. Calculated magnetic-field values for all sections are summarized below in Table 7-1 and Table 7-2.

Table 7-1 - Magnetic-field levels (mG) at average loading

Segment Number	Configuration	–ROW edge	+ROW edge
XS-01	Existing	1.8	4.0
	Post Construction	0.7	2.4
	Post Construction + 5 years	0.7	2.7
XS-02	Existing	1.1	0.2
	Post Construction	0.9	0.3
	Post Construction + 5 years	1.0	0.3
XS-03	Existing	0.9	0.1
	Post Construction	1.1	0.2
	Post Construction + 5 years	1.2	0.3

Table 7-2 - Magnetic-field levels (mG) at peak loading

Segment Number	Configuration	–ROW edge	+ROW edge
XS-01	Existing	5.0	9.5
	Post Construction	1.4	4.4
	Proposed + 5 years	1.2	4.2
XS-02	Existing	2.3	0.5
	Post Construction	1.7	0.6
	Proposed + 5 years	1.5	0.5
XS-03	Existing	1.8	0.3
	Post Construction	2.1	0.5
	Post Construction + 5 years	1.9	0.4

Electric Fields

Electric-field levels were calculated to either decrease by up to 0.1 kV/m (at the eastern ROW edge) and decrease by 0.2 kV/m or not increase by more than 0.1 kV/m (at the western ROW edge) as a result of the Project. On the ROW the maximum calculated electric-field level was 1.9 kV/m, decreasing to 0.9 kV/m post-construction. The maximum calculated electric field level at either ROW edge along the entire Project route was 0.4 kV/m, decreasing to 0.2 kV/m post-construction. Electric-field levels at all locations along the route are well below the ICNIRP Reference Level of 4.2 kV/m and the ICES Exposure Reference Level of 5 kV/m for the general public. Calculated electric-field values for all sections are summarized below in Table 7-3.

Table 7-3. - Electric-field levels (kV/m)

Segment Number	Configuration	–ROW edge	+ROW edge
XS-01	Existing	0.2	0.4
	Post Construction	0.1	0.2
	Proposed + 5 years	0.1	0.2
XS-02	Existing	0.3	< 0.1
	Post Construction	0.2	0.1
	Post Construction + 5 years	0.2	0.1
XS-03	Existing	0.3	< 0.1
	Post Construction	0.2	< 0.1
	Post Construction + 5 years	0.2	< 0.1

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8 Mitigation Measures

Mitigation measures will effectively minimize Project impacts on the natural and social environment. Mitigation measures have been designed for the Project to minimize impacts associated with each phase of construction. Many of these measures are standard proven procedures that TNEC incorporates in all transmission line and substation construction projects. Others are site specific measures designed to meet the needs of this particular Project. These measures are described in the following sections.

8.1 Design Phase

TNEC has incorporated design measures to reduce the impacts associated with the construction and operation of the Project. These measures include alignment, design, pole structure locations and use of existing access roads where possible, which have resulted in the avoidance and minimization of residential and wetland impacts, and soil disturbance. Residential impacts will be minimized by locating the proposed electric transmission line in the existing ROW. The design and construction of the proposed electric transmission line incorporates measures that will minimize impacts to wetlands and other natural features within the ROW. Of the 105 proposed transmission line structures, 56 will be outside of wetland areas. Further, a wetland mitigation plan, which includes the implementation of BMPs (i.e., compost or wood chip mulch filter sock, silt fence, vegetation management, etc.) during and following construction, to minimize impacts associated with the proposed Project, will be filed with the coastal/wetlands application for the Project.

The following sections detail the various measures that were implemented in the design phase of the Project to reduce impacts to the natural and social environment.

8.1.1 Mitigation of Natural Resource Impacts

8.1.1.1 Transmission Line

The design of the transmission lines has been developed to reduce wetland impacts through avoidance, minimization, and restoration. Consequently, unavoidable wetland impacts associated with the construction of replacement structures for the Project have been limited to approximately 1,322 SF of permanent salt marsh disturbance due to filling for new transmission line structures concrete caisson foundations. Mitigation for these alterations of salt marsh must be provided in order to comply with state and federal wetland regulations. Additionally, unavoidable freshwater wetland impacts associated with the directly embedded structures and concrete caisson foundations are limited to approximately 855 SF in biological wetland. Mitigation for the directly embedded structure is expected to be completed in kind with the restoration of the areas where the existing poles are removed.

Erosion controls will be installed along the perimeter of the excavation areas to avoid sedimentation of the adjacent wetlands. Following excavation, the disturbed areas will be seeded and mulched.

Potential short-term and long-term impacts to wildlife will be mitigated. Wildlife impacts in the short term will be mitigated by limiting ground disturbances to pole structure and access road locations, and restoring and/or stabilizing areas immediately following construction. Vehicle and equipment traffic will be limited to established access roads as much as practical. Long-term mitigation efforts will include minimizing permanent wetland disturbance and maintaining wetland functions following construction.

Overall, the proposed mitigation plan has been designed to minimize impacts to environmental resources resulting from the proposed Project.

8.1.1.2 Access Roads

To further mitigate impacts the proposed access roads have been situated to cross streams and wetlands at the narrowest practical point to minimize disturbance. Each of the proposed access roads through wetlands was thoroughly scrutinized for consistency with the RIDEM Freshwater Wetland Rules and CRMC CRMP and will not be a random, unnecessary, or undesirable alteration of a coastal feature or freshwater wetland. Each location was selected to traverse the wetland fringe or a previously disturbed area within the wetland.

8.1.2 Mitigation of Social Resource Impacts

In addition to avoiding and minimizing impacts to the natural environment within the Project ROW, several design practices have been incorporated to minimize or avoid impacts to the surrounding social environment. To minimize impacts, TNEC will construct the F184N and E183 Lines Transmission Line Rebuild Project within the existing ROW. Vegetation management will be limited so that a visual buffer between residences and the Project is maintained where possible. For the tree removals needed to support the reconfigured Warren Substation Tap Lines, an approximate 50-foot vegetated buffer will be left intact between the East Bay Bike Path and the reconfigured Warren Tap Line area which should continue to screen the area. Additional vegetative screening elements are also being considered around the south side of the Warren Substation and Taps and would be subject to discussion with the bike path owner/operators.

TNEC has engaged and will continue to engage in community outreach to advise ROW abutters and others of Project plans.

8.2 Construction Phase

TNEC will implement several measures during construction which will minimize impacts to the environment. These include the use of existing access roads and structure pads where possible, installation of erosion and sedimentation controls, supervision and inspection of construction activities within resource areas by an environmental monitor and minimization of disturbed areas. The following section details various mitigation measures which will be implemented to minimize construction related impacts.

8.2.1 Mitigation of Natural Resource Impacts

Given the existing transmission line's location and engineering constraints for the rebuilt transmission line, it was necessary to site 51 structures within coastal or freshwater wetlands and 30 structures within state-regulated contiguous/jurisdictional areas and wetland buffers.

Access roads were established within portions of the ROW during the initial construction of the existing transmission lines in the 1960s. To minimize disturbance within the ROW vehicles will utilize these existing access roads during construction where practical.

Access to the structures through wetland areas will be obtained by extending timber construction mats from the existing maintained portion of the ROW, where possible. Construction access will be limited to the existing and proposed structure locations, and will be lined with erosion and sedimentation control BMPs. Following erection of the structure, each area will be restored.

Clearing and vegetation management operations will be confined to the ROW and the Warren Substation which is owned by TNEC in fee. Excavated soils will be stockpiled and spread in approved upland locations well outside biological wetland areas in such a manner that general drainage patterns will not be affected. Specific mitigation measures will be implemented to minimize potential erosion and sedimentation when clearing adjacent to wetland areas. These mitigation measures will include the installation of compost filter sock (CFS) diversions or approved equivalent across the slope to intercept storm water runoff which will be directed through hay bales or silt fence to remove suspended sediment. These structures will be maintained until vegetative cover is re-established. In addition, CFS or approved equivalent will be installed across disturbed slopes adjacent to wetland areas in accordance with an erosion and sediment control plan.

Stream crossings will be constructed perpendicular to the channel to the extent possible to reduce the crossing length and reduce the potential for disturbance to the water body. Design and implementation of all stream crossing structures (i.e., temporary mat bridges) will comply with standards and specifications as outlined in the "Rhode Island Soil Erosion and Sediment Control Handbook." Pole structures have been located to minimize the number of temporary and permanent stream crossings required. Temporary access roads will be established where the substrate is sufficiently firm or level to support equipment without creating a disturbance to the soil substrate.

8.2.1.1 Erosion and Sedimentation Control

Erosion and sediment control devices will be installed along the perimeter of identified wetland resource areas prior to the onset of soil disturbance activities to ensure that spoil piles and other disturbed soil areas are confined and do not result in downslope sedimentation of sensitive areas. Low growing tree species, shrubs and grasses will only be mowed along access roads and at structure locations. Erosion control measures will be inspected on a regular basis during construction and maintained or replaced as necessary.

Dewatering may be necessary during excavations for pole structures adjacent to wetland areas. If needed, water will be pumped into a straw bale and geotextile fabric settling basin or dewatering filter bag which will be located in approved areas outside wetland resource areas. The pump intake hose will not be allowed to set on the bottom of the excavation throughout dewatering. The basin and all accumulated sediment will be removed following dewatering operations, and the area will be seeded and mulched.

8.2.1.2 Supervision and Monitoring

Throughout the construction project, the services of an environmental monitor will be retained. The primary responsibility of the monitor will be to oversee construction activities including the installation and maintenance of erosion and sedimentation controls, on a routine basis to ensure compliance with federal and state permit requirements, TNEC policies and other commitments. The environmental monitor will be a trained environmental specialist responsible for supervising construction activities relative to environmental issues. The environmental monitor will be experienced in the erosion control techniques described in this SR and will have an understanding of wetland resources that require protection.

During periods of prolonged precipitation, the monitor will inspect all environmental controls to confirm that they are functioning properly. In addition to retaining the services of an environmental monitor, the contractor will be required to designate an individual to be responsible for the daily inspection and upkeep of the environmental controls. This person will also be responsible for providing direction to the other members of the construction crew regarding matters of wetland access and appropriate work methods. Additionally, all construction personnel will be briefed on Project environmental compliance obligations prior to the start of construction. Regular construction progress meetings will provide the opportunity to reinforce the contractor’s awareness of these issues.

8.2.2 Mitigation of Social Resource Impacts

TNEC will minimize social resource impacts during construction by incorporating several standard mitigation measures. By use of an established transmission line ROW rather than creating a new ROW, the potential for disruption due to construction activities will be limited to an area already dedicated to transmission line uses. Construction generated noise will be limited by the use of mufflers on all construction equipment. Dust will be controlled by wetting and stabilizing access road surfaces, as necessary, and by maintaining crushed stone aprons at the intersections of access roads with paved roads. By notifying abutters of planned construction activities before and during construction of the line, TNEC will minimize the potential for disturbance from the construction.

Where short-term impacts are unavoidable, TNEC will minimize the impacts to the extent practical. By carrying out the construction of the line in a timely fashion, TNEC will minimize the duration of impacts. The construction of the replacement structures and associated appurtenances in the existing ROW may cause some temporary- minor disturbance to the abutting property owners.

TNEC will prepare a traffic management plan which will minimize impacts associated with increased construction traffic on local roadways.

TNEC will provide periodic updates to abutters and other interested parties during construction. TNEC's public outreach team will be the point of contact for abutters and other interested parties.

8.3 Post-Construction Phase

Following the completion of construction, TNEC will further minimize the impacts of project on the natural and social environment. These measures include revegetation and stabilization of disturbed soils, ROW vegetation management practices vegetation screening maintenance at road crossings and in sensitive areas and other site-specific measures as described below.

8.3.1 Mitigation of Natural Resource Impacts

Restoration efforts, including final grading and installation of permanent erosion control devices, and seeding of disturbed areas, will be completed following construction. Construction debris will be removed from the Project site and disposed of at an appropriate landfill. Pre-existing drainage patterns, ditches, roads, fences, and stone walls will be restored similar to their former condition, where appropriate and practical.

Vegetation maintenance of the ROW will be accomplished with methods identical to those currently used in maintaining vegetation along the existing ROW. TNEC's ROW vegetation maintenance practices encourage the growth of low-growing shrubs.

Avian deterrents will be installed on all replacement structures. Existing dedicated pole mounted osprey platforms will be retained and some of the old poles to be removed in the area of the Warren Substation may be left in place and mounted with platforms and a perch as additional osprey nesting habitat.

To mitigate for the 1,322 SF (0.03 acres) of salt marsh and 855 SF (0.02 acres) freshwater wetland displacement due to replacement structure foundations, approximately 3,085 SF (0.07 acres) of salt marsh and approximately 2,375 SF (0.05 acres) of contiguous freshwater wetland restoration is proposed. The wetland restoration effort proposes a 2.3:1 ratio and is expected to restore a former area of salt marsh displaced historically by fills associated with a facility that contained a railroad powering station and garage for train engines and box cars. A larger area was targeted for restoration than is required by the 2:1 ratio, to account for any unforeseen field conditions that might affect design impacts during the construction. The proposed restoration area also includes the USACE mitigation requirement for the conversion of approximately 1,791 SF (0.04 acres) of forested wetland to scrub-shrub wetland resulting from the tree removals needed to reconfigure the Warren Substation transmission lines taps.

The proposed restoration area is on the TNEC owned Natural Gas Regulator Station parcel at 28 Brown Street in Warren which is approximately 500 feet northwest of the Project Area. The proposed restoration area abuts Type 1 Waters of the Palmer River. The proposed restoration area will offer a range of floor elevations similar to the various displacement areas, providing high and low salt marsh components and contiguous freshwater wetland. The proposed area will be over excavated to the specified design elevations, supplemented with 12 inches of medium to fine sand supplemented with organics. The proposed marsh restoration area will be planted with plugs of smooth cordgrass and saltmeadow cordgrass as indicated on the planting plan. The proposed contiguous freshwater wetland restoration area will be planted with native trees and shrubs and seeded with a native New England wetland seed mix. The proposed tree species to be planted are red maple (Acer rubrum) and black tupelo (Nyssa sylvatica). The proposed shrub species to be planted are arrowwood viburnum (Viburnum dentatum), highbush blueberry (Vaccinium corymbosum), and silky dogwood (Cornus amomum). At the transition between the proposed marsh and contiguous freshwater wetland area, a row of hightide bush (Ivans frutescens) will be planted. Construction of the restoration area will be regularly reviewed by a qualified wetlands biologist, and the restored salt marsh will be monitored by a qualified wetland biologist for a duration of three full growing seasons. Annual reports can be prepared and provided if requested.

8.3.2 Mitigation of Social Resource Impacts

TNEC may install landscape screening along the southern fence line of the Warren Substation and the reconfigured Tap Line Area to the west of the substation to mitigate potential visual impacts. An undisturbed vegetative buffer of approximately 50 feet will be retained in its natural state along the bike path west of the substation.

9

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Appendix A:

Status of Research on Extremely Low Frequency Electric and Magnetic Fields and Health, January 2022 through April 2024. March 19, 2025

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Appendix B:

Agency Correspondence

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