ENERGY FACILITY SITING BOARD ENVIRONMENTAL REPORT

Aquidneck Island Reliability Project

Portsmouth and Middletown, Rhode Island

PREPARED FOR

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This document has been reviewed for Critical Energy Infrastructure Information (CEII). December 2015

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Table of Contents

Section	Description	Page

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List of Tables

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List of Figures
(Bound Separately as Volume 2)

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List of Appendices

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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
AIRP	Aquidneck Island Reliability Project
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
Auto transformer:	A transformer with a single winding per phase in which the lower voltage is obtained by a tap on the winding (see power transformer).
BMPs:	Best Management Practices
Bundle:	Two or more wires joined together to operate as a single phase.
Cable:	A fully insulated conductor installed underground.
Circuit Breaker:	A switch that automatically disconnects power to the circuit in the event of a fault condition. Located in substations. Performs the same function as a circuit breaker in a home.
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.

Conduit:	Pipes, usually PVC plastic, typically encased in concrete to house and protect underground power cables or other subsurface utilities.
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.
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.
Double-Circuit:	Two circuits on one structure.
Duct:	Pipe for underground power cables (see also Conduit).
Duct Bank:	A group of ducts or conduit usually encased in concrete in a trench.
EFSB:	Rhode Island Energy Facility Siting Board
EHS:	Extra high strength
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).
LTC:	Load Tap Changer
MCSPCC:	Metal-clad Switchgear Power and Control Center
mG:	milliGauss. Equals 1/1000 Gauss (see Magnetic Field).
MODF:	Mineral Oil Dielectric Fluid
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.
MVAR:	Megavolt Ampere Reactive. Reactive power, or the power associated with inductive or capacitive elements. Also called MegaVARS.
MW:	Megawatt. Megawatt equals 1 million watts. A measure of the work electricity can do.
NEPOOL:	New England Power Pool

NERC:	North American Electric Reliability Corporation
NESC:	National Electrical Safety Code
NPCC:	Northeast Power Coordinating Council
NWA:	Non-Wires Alternative
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.
Power Transformer:	A device used to transform voltage levels to facilitate the efficient transfer of power from the generating plant to the customer. A step-up transformer increases the voltage while a step-down transformer decreases it. Power transformers have a high voltage and a low voltage winding for each phase (see also Auto Transformer).
Project ROW:	The limits of the easements and fee ownership that form the 61 and 62 Lines Corridor
PVC:	Poly Vinyl Chloride
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
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
RMS:	Root Mean Square
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.
Step-down Transformer:	See Power Transformer.
Step-up Transformer:	See Power Transformer.
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.
Subtransmission System:	Circuits that supply distribution substations. The term subtransmission denotes voltages lower than 69 kV.
Sulfur hexafluoride (SF_6):	A colorless, odorless and nonflammable gas used as an electrical insulator in high voltage equipment.
Switching Station:	Same as substation except with no power transformers. Switching of circuits and other service functions take place in this installation.
Terminal Point:	The substation or switching station at which a transmission line terminates.
Terminal Structure:	Structure typically within a substation that ends a section of transmission line.
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.
XLPE:	Cross Linked Polyethylene. A type of underground cable insulation.

1.0 Introduction

1.1 Report Preparation and Responsibilities

This Environmental Report (ER) will support applications to the Rhode Island Energy Facility Siting Board (EFSB) and other agencies by The Narragansett Electric Company d/b/a National Grid (TNEC or the Company)[1] in connection with the reconstructing and upgrading of the existing 61 and 62 Transmission Lines (61 and 62 Lines) from 69 kV to 115 kV through Portsmouth Rhode Island (RI), the replacing of the Jepson Substation #37 in Portsmouth and Middletown, RI, and the reconfiguring of the existing Dexter #36 Substation in Portsmouth, RI (the Project). The Project is part of a broader plan, known as the Aquidneck Island Reliability Project (AIRP)[2], aimed at improving the reliability of Aquidneck Island electric system as a whole.

This ER has been prepared under the direction of Ayodele Osimboni, National Grid Project Manager for the Project. Numerous employees of National Grid, including planners, engineers and legal personnel contributed to the ER. The description of the affected natural and social environments, and impact analyses were prepared by Vanasse Hangen Brustlin, Inc. (VHB) and other consultants to National Grid including The Public Archaeology Laboratory, Inc. (PAL) for cultural resources, Environmental Design & Research, P.C. (EDR) for visual resources, Exponent, Inc. for analysis of health effects of electric and magnetic fields (EMF) and EMF calculations for the Jepson Substation, and Vanderweil, Inc. for engineering, design and EMF calculations (for 61 and 62 Lines).

1 TNEC, a subsidiary of National Grid USA, is an electricity distribution and transmission company serving approximately 465,000 customers in 38 Rhode Island communities. National Grid USA is a public utility holding company. Other subsidiaries of National Grid USA include operating companies such as New England Power Company, Massachusetts Electric Company, Nantucket Electric Company, and Niagara Mohawk Power Corporation, as well as National Grid USA Service Company, Inc. (National Grid) which provides services such as engineering, facilities construction and accounting.

2 The AIRP also includes a temporary distribution feeder installation at Gate Two Substation # 38 in Newport, the development of a new substation in Newport, RI off of JT Connell Highway, improvements to the 37K33 subtransmission line in Middletown, RI and the retirement of the following substations: Jepson # 37 in Portsmouth, RI, Baily Brook # 19, North Aquidneck # 21, and South Aquidneck # 122 in Middletown, RI and Vernon # 23 in Newport, RI.

1.2 Compliance with EFSB Requirements

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.

2.0 Executive Summary

2.1 Introduction

This ER has been prepared in support of an application to the EFSB for construction of major energy facilities and for submission with applications to other state and local agencies required for the Project. This ER 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 ER details the Project, discusses the alternatives to the Project which were considered and analyzed, describes the specific natural and social features which 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 3 of this ER, which includes a description of the studies and forecasts regarding the need for the proposed transmission system improvements. Section 4 provides a detailed description of each of the components of the Project, and also 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 5 of this ER. A detailed description of all environmental and social characteristics within and immediately surrounding the proposed Project locations is included as Sections 6 and 7, respectively. Section 8 of this ER identifies the impacts of the Project on the natural and social environments both on and off site. Section 9 summarizes proposed mitigation measures which when implemented will effectively offset impacts associated with the Project. Finally, Section 10 lists the federal, state, and local government agencies which may exercise licensing authority and from which TNEC may be required to obtain approvals prior to constructing the Project.

2.2 Project Description and Proposed Action

TNEC is proposing to perform a series of electric system improvements in order to continue to provide reliable electric supply to Aquidneck Island. The Project will reinforce and enhance the capacity of the existing transmission system on Aquidneck Island.

TNEC is proposing to rebuild and upgrade two transmission lines, construct a new Jepson Substation, and reconfigure the existing Dexter Substation. The existing 69 kV 61 and 62 Lines will be rebuilt and upgraded to 115 kV on the existing ROW beginning at the Dexter Substation located off Freeborn Street in Portsmouth and terminating at the new Jepson Substation off Jepson Lane in Middletown, a distance of approximately 4.4 miles (hereinafter the 61/62 Line Upgrade Project). The new Jepson Substation, which will replace the existing Jepson Substation at Jepson Lane in Portsmouth, will be located on the west side of Jepson Lane in Middletown and Portsmouth[3] (hereinafter the Jepson Substation Project). The existing Dexter Substation will be reconfigured through the removal of the existing 69 kV equipment, and the addition of two dead-end structures, two motorized disconnects and one circuit switch (collectively, the Dexter Substation Project).

Figure 2-1[4] provides an overview of the Project location and Figure 2-2 (sheets 1 through 17) provides more detail regarding the Project alignment. Figure 2-3 provides detail on the new Jepson Substation.

2.3 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 lasting one minute or more. The quality of electric service refers to voltage levels, variations in voltage frequency, harmonic content, and outages lasting less than one minute.

TNEC recently completed a study of transmission system reliability on Aquidneck Island. The April 2015 Newport Area (Aquidneck Island) Transmission Solution Study Report (Aquidneck Island Study provided at Appendix A) documented potential violations of these transmission planning standards under certain contingencies related to the 61 and 62 Lines. Specifically, if the 61 or the 62 Line, or

3 The new Jepson Substation is located within Middletown, with only one of two access driveways located in Portsmouth.
4 All figures are bound separately as Volume 2.

certain equipment at the Dexter or Jepson Substations were to malfunction or be taken out of service, other equipment may overload. This could force TNEC to drop electric service to some Aquidneck Island customers until the out-of-service equipment is repaired, or until demand falls sufficiently to allow the Company to serve all of its customers with its remaining equipment.

The Aquidneck Island Study demonstrates that the existing transmission facilities on Aquidneck Island are inadequate to meet NERC, NPCC, and ISO-NE reliability standards and criteria for the projected load and generation conditions in this area. These problems become increasingly more severe as peak load continues to grow.

Studies of the physical conditions of the Jepson Substation demonstrate that equipment at the Substation is aging or obsolete, and replacement parts are difficult to obtain. Furthermore, the existing control house is not large enough to accommodate required equipment upgrades.

The studies demonstrate a need to construct a new substation and new transmission facilities to improve the reliability of the transmission system serving Aquidneck Island. This Project proposes the following investments to address this condition:

- Rebuild and upgrade the 61 and 62 Lines from 69 kV to 115 kV between the Dexter and Jepson Substations.
- Relocate the Jepson Substation to a new site and rebuild it at 115 kV to address both asset condition and reliability issues.
- Reconfigure the Dexter Substation to accommodate the 115 kV upgrade.

These problems constitute needs that must be addressed immediately.

2.4 Alternatives

An analysis was undertaken to evaluate the feasibility of alternatives to the proposed transmission system improvements. TNEC evaluated multiple alternatives to the 61/62 Line Upgrade Project, including the No-Build Alternative, a 69 kV reinforcement alternative, a Non-Wires Alternative (NWA), alternative overhead routes, and underground transmission alternatives. TNEC also evaluated alternative siting and configuration options for the new Jepson Substation. 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.

2.5 Summary of Environmental Effects and Mitigation

The proposed Project will be designed and constructed in a manner that minimizes and mitigates the potential for adverse environmental impacts. The Project will have minimal impact on the geologic, soil, surface water, groundwater, and wetland resources of the 61 and 62 Line ROW (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.

The proposed transmission line and substation construction may cause a small loss of 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., straw wattles, silt fence, etc.) and the re-establishment of vegetation will be employed to minimize wetland and water quality impacts.

The Project is designed to reduce wetland impacts through measures including avoidance, minimization, and mitigation (where required by the Rhode Island Department of Environmental Management (RIDEM)). Construction of the Project will result in temporary impacts to wetland resources caused by vegetation clearing, and swamp matting for access to structures and work areas, and existing wood pole removals. Permanent impacts will result from the placement of fill required for the new structure foundation construction.

Unavoidable wetland impacts associated with the construction of 50 of the transmission structures located in state-regulated wetlands have been limited to approximately 2,160 square feet (SF) of permanent biological wetland alteration due to filling. No transmission structures are proposed to be located within Federal Emergency Management Agency (FEMA) mapped one percent annual chance flood area (formerly 100-year floodplain). However, Structure No. 135, a double circuit structure, will be located proximate to the one percent annual chance flood area associated with the west side of Sisson Pond.

The construction of the approximately 3.1 acre new Jepson Substation will require filling and/or grading approximately 102 square feet (SF) of state- and federal-regulated Palustrine Wetland and 10,745 SF of state-regulated 50-foot Perimeter Wetland. Approximately 1.4 acres of shrub and sapling clearing will be necessary for the construction of the new Jepson Substation of which approximately 5,717 SF is located within state- and federal-regulated Palustrine Wetland and 6,958 SF is located within state-regulated 50-foot Perimeter Wetland. Of the 1.4 acres, approximately 0.31 acres of mature tree clearing is required for the temporary 69 kV 63 Line transmission line re-routing to allow substation construction. This area will not be grubbed so vegetation can be re-established once the temporary line is removed. Incidental side-line tree removal may be required where "danger trees" are present along the ROW.

In addition to these mitigation measures, the services of an environmental monitor will be retained throughout the entire 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 National Grid construction practices, and to monitor the effectiveness of BMPs and make adjustments as necessary.

2.6 Summary of Social Effects and Mitigation

Based on the location of the Project, the greatest potential for social impact is the effect of the proposed facilities and ROW maintenance on current and future land uses. Because the Project is located 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.

2.6.1 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 1990 and 2010, the population within the Town of Middletown decreased by 3,350 individuals. The RI Statewide Planning Office is projecting a further decrease of 9.7% between 2010 and 2020. Between 1990 and 2010, the population within the Town of Portsmouth increased nominally by 572 individuals. The RI Statewide Planning Office is projecting a continued increase of 2.32% between 2010 and 2020. These trends are not expected to be significantly affected by the Project.

2.6.2 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

1990 and 2015, employment estimates in Middletown decreased from 8,335 to 8,020, and also decreased in Portsmouth from 8,863 to 8,842. The Project is expected to have a net benefit on employment and Tax Revenue within Newport County through the creation of 300 jobs, and municipal tax revenues of $532,800 in Portsmouth and $891,900 in Middletown during the first five years of the Project' life (2017-2022).

2.6.3 Land Use

Land Use within the Study Area contains residential areas, and other land uses including recreational, commercial, 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 61/62 Line Project since the Project occurs within an existing developed transmission corridor. The proposed Jepson Substation will be built on an approximately 20 acre parcel owned by TNEC on the west side of Jepson Lane. The parcel is developed with two distribution lines and the 69 kV 63 Line. While the substation improvements are new, the parcel has supported electric utility infrastructure and been subject to routine maintenance activities such as vegetation mowing for several decades.

2.6.4 Visual Resources

The visual impact analysis performed for the Project indicates that the proposed transmission lines 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 an existing transmission line ROW for the proposed facilities, and the fact that additional tree clearing is not required along the majority of the ROW. Construction of the new Jepson Substation will have more significant visual impact. However, this impact is being mitigated by proposed screening measures at the new substation site, and the removal of five existing substations on Aquidneck Island.

Within a one-mile radius Study Area, topographic viewshed analysis indicates that areas with potential views of the proposed 61 and 62 Transmission Line structures will increase by approximately 6.5 percent, when compared to the viewshed of the existing structures. Factoring the screening effect of vegetation into the viewshed analysis indicates that approximately 59 percent of the study area could have potential views of the Project.

Field review suggests that actual Project visibility is likely to be more limited than suggested by viewshed mapping. 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. Open views of the existing lines were available in some agricultural areas, in the central and southern portions of the visual study area, but were screened in more wooded settings. 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. Clear views of the existing 61 and 62 Transmission Line structures are primarily available from streets and yard areas immediately adjacent to the Project ROW, including several relatively new subdivisions where houses have been built in close proximity to the existing transmission lines.

2.6.5 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 61 and 62 Lines are not expected to generate sound under normal operating conditions. A noise analysis was performed to evaluate the impact of the new Jepson Substation. Sound levels for the new substation were calculated based on the full operation of the proposed transformers. The sound levels generated by the new transformers range from 37 dB(A) to 48 dB(A) at the property line. These sound levels are below both Portsmouth's and Middletown's sound limit of 50 dB(A) for residential zoned areas during the night time period with pure tone, the most stringent sound criteria that could be applied. Therefore, the noise analysis concluded that the new Jepson Substation will comply with the Portsmouth and Middletown noise ordinances.

2.6.6 Cultural

2.6.6.1 New Jepson Substation

In accordance with Section 106 of the National Historic Preservation Act, the Rhode Island Historical Preservation and Heritage Commission (RIHPHC) has concluded that the new Jepson Substation will have no effect on any significant archeological resources (those listed on or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC in Appendix C. RIHPHC is currently reviewing the proposed New Jepson Substation layout and details for effects to historic properties.

2.6.6.2 Upgrading and Rebuilding 61 and 62 Lines

The RIHPHC determined that no further archeological work is warranted for the 61/62 Line Upgrade Project. RIHPHC also concluded that the 61/62 Line Upgrade Project will have no effect on any significant archeological resources (those listed on, or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC dated September 16, 2015 in Appendix C.

PAL completed an historic architectural resources survey for the 61/62 Line Upgrade Project. On the basis of the results of the survey and effects assessment, PAL concluded that the proposed Project will have no adverse effect on historic architectural properties. The RIHPHC reviewed the historic architectural resources survey completed by PAL and requested additional information to complete their review which TNEC provided on December 16, 2015.

TNEC will also consult with the Army Corps of Engineers regarding potential effects the Project may have on properties potentially eligible, eligible or listed in the National Register.

2.6.7 Transportation

Transportation infrastructure within the Study area includes both State routes and local roadways. The ROW crosses or abuts 16 town roads which will be utilized to access the ROW as well as the Dexter and Jepson 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.

2.6.8 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 61 and 62 Lines, the rebuilt 61 and 62 Lines, and the new Jepson Substation. Rebuilding the 61 and 62 Lines will reduce both electric and magnetic fields along both edges of the ROW. In particular, modeled magnetic fields on the west edge of the ROW range from 38.1 milliGauss (mG) to 39.7 mG with the current line configuration and 2018 average loads. Following the rebuild, these modeled magnetic fields decline to 6.6 mG. On the east edge of the ROW, magnetic fields range from 31.7 mG to 40.1 mG, with 2018 average loads, and will decline to 10.2 to 24.8 mG following the rebuild.

Calculated magnetic field levels at the property line of the proposed Jepson Substation site are generally 2 mG or less except where the transmission and distribution lines enter and leave the property.

2.7 Conclusion

Completion of the Project as proposed by TNEC will address the electric reliability needs of the Aquidneck Island area 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 prevented 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 9 of this ER.

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3.0 Purpose and Need

3.1 Introduction

National Grid 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 lasting one minute or more. The quality of electric service refers to voltage levels, variations in voltage frequency, harmonics, and outages lasting less than one minute.

To reduce the chance of a long-term outage affecting large numbers of customers in one geographic area, National Grid, like other U.S. electric utilities, has developed design criteria, policies, and standards used both to assess the adequacy of its electric transmission system for all reasonably anticipated conditions and also to provide guidance in the design of future modifications or upgrades to the electric transmission system. These electric transmission design criteria and standards are contained in the latest version of the National Grid Transmission Group Procedure 28 – Transmission Planning Guide (TGP-28).

National Grid recently completed a study of transmission system reliability on Aquidneck Island. The Aquidneck Island Study documented potential violations of these transmission planning standards under certain contingencies related to the 61 and 62 Lines. Specifically, if the 61 or the 62 Line, or certain equipment at the Dexter or Jepson Substations, were to malfunction or be taken out of service other equipment may overload. This could force TNEC to drop electric service to some Aquidneck Island electric customers until the out-of-service equipment is repaired, or until electric demand falls sufficiently to allow the Company to serve all of its customers with its remaining equipment. The Aquidneck Island Study is provided at Appendix A.

TNEC also has identified a need to upgrade, modernize and, relocate the existing Jepson Substation. Equipment at this substation is up to 60 years old, and it is increasingly difficult to obtain spare parts when they are needed for maintenance. These needs have been documented in a series of three studies undertaken in 2005, 2011 and 2013 (Jepson Substation Asset Condition Studies). In addition, the Jepson Substation is located within a watershed protection zone and proximate to Sisson Pond, a public drinking water supply, raising environmental concerns.

The Project will improve the reliability of electric supply to the area by increasing the loading capability of the transmission system and replacing the aging Jepson Substation with modern equipment on a nearby site. This will enable TNEC to continue to provide reliable electric supply to its customers on Aquidneck Island.

3.2 Transmission Planning Process

The interconnected electric power system is a complex network of generation, transmission and distribution facilities which must reliably deliver electrical power to utility customers. To be reliable, the system must provide acceptable performance when components are out of service for maintenance or due to unexpected failures of equipment. Performance is typically measured in terms of transmission equipment thermal loading, nominal voltage and voltage variation, power transfers, generator stability response, and available short-circuit current.

National Grid routinely assesses the physical condition and operating record of its existing transmission and distribution facilities to ensure that they will continue to 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.

3.2.1 Transmission Planning Studies – Needs Analysis

All National Grid transmission facilities in New England are designed in accordance with the reliability criteria contained in the latest version of TGP-28, the ISO New England (ISO-NE) and New England Power Pool (NEPOOL) standards, the Northeast Power Coordinating Council (NPCC) criteria, and the North American Electric Reliability Corporation (NERC) standards (the Transmission Planning Documents). These criteria have been established to keep equipment loadings within ratings, and equipment voltages within a reasonable range for reasonably foreseeable contingencies.

Each element of the transmission system has a set of thermal ratings that are determined such that maximum use can be made of the equipment without damage or undue loss of equipment life. The equipment loading capabilities are determined using maximum allowable equipment temperatures as criteria. The allowable temperatures are established by manufacturer's design, American National Standards Institute (ANSI) and other national standards, known material properties, or in the case of a transmission line, the design basis of the line. The range of allowable voltage is established by manufacturer's design, and ANSI and other standards.

National Grid routinely undertakes transmission planning studies to determine whether new or upgraded transmission facilities are needed within a specified timeframe (typically ten years) to maintain reliable electric power within a specific geographic area. These studies are conducted using a "what-if" approach that tests the loading of each piece of equipment under a range of reasonably stressed system conditions. National Grid's transmission planning guidelines, which are based on ISO-NE, NEPOOL, NPCC and NERC standards, identify the range of conditions which need to be considered in a particular transmission planning study. The capability of the system under these conditions is studied using computer simulations which model the electrical parameters of the system. The transmission system is analyzed under "normal" conditions, and also under contingencies involving the loss of one or more transmission system facilities. The contingency analysis is carried out for various system generation dispatches and system transfer levels in order to ensure that the area of interest is tested under conditions that reasonably maximize the electrical stress to the area.

Contingency analysis involves two levels of study. The first level is single contingency analysis (commonly referred to as N-1 analysis). It involves testing all possible single contingencies that could impact the area of interest. A single contingency represents a "single event", such as a single transmission line, transformer or generator outage, or the failure of a breaker or double-circuit tower. The contingency is simulated and the effects of the contingency on the power system are studied. The resulting system loadings and voltage levels are assessed to see if they meet criteria following the contingency event.

The second level of study is second contingency analysis (commonly referred to as N-1-1 analysis). This analysis test combinations of two initiating events that occur close together in time. The first initiating event involves taking out of service a key element within the area of interest, such as a 345 kV line, a 345/115 kV transformer, a 115 kV line, or a generator. Following the first event, the system generation and power flows can be adjusted in preparation for the next initiating event. Generation and power flow adjusted through the use of generators capable of ten-minute reserve, generation tripping, use of transformer load tap changers, switching of series and shunt capacitors, and switching of reactors is then performed. Single contingency analysis (N-1 analysis) is then performed on the adjusted power system.

Once the computer modeling is complete, the results of each N-1 and N-1-1 contingency are analyzed to determine whether any piece of equipment is carrying more electric current than the equipment is rated for, based on the assumed ambient temperatures. Voltage levels are checked to determine that they are within appropriate ranges. The effect of future loads is reviewed. System stability, grounding, fault current levels, operability, and ability to maintain the system are also considered. As a result of this analysis, transmission planners can identify elements of the transmission system that need to be reinforced in order to continue to provide reliable electric service within the study area.

3.2.2 Transmission Planning Studies – Solutions Studies

After identifying problems that could occur within the study area under expected electrical loads and possible contingency situations, plans are developed to resolve the problems. Typically these plans call for replacing existing equipment or adding facilities to the electric system. The plans are developed and evaluated based on the reliability criteria as described in the Transmission Planning Documents. Other factors used to evaluate proposed plans include equipment standards and specifications, relaying practices, operational and maintenance considerations, safety, environmental impacts, and economics. The evaluation of electrical alternatives leads to a recommended plan that is summarized in a report.

In developing proposed solutions, the analyses in the 10–year term receive the most focus. However, some screening analysis is done to evaluate the robustness of the proposed plans in the more distant future, from both a technical and economic perspective. The objective is to avoid building facilities that do not fit into the long-term needs of the transmission system.

3.3 Planning Studies Related to the Aquidneck Island Area

The following sections summarize the Aquidneck Island Study and the Jepson Asset Condition Studies.

3.3.1 Aquidneck Island Study

The Aquidneck Island Study addresses the reliability of transmission supply to Aquidneck Island, which consists of the City of Newport, and the Towns of Middletown and Portsmouth. The transmission system supplying Aquidneck Island consists of three 69 kV lines known as the 61, 62, and 63 Lines. The 61 and 62 Lines originate at the Dexter Substation, located in Portsmouth, and terminate at the Jepson Substation in Portsmouth. A single 69 kV line, the 63 Line, extends further south from Jepson Substation into Newport. This line feeds a US Navy-owned substation, located within the Newport Naval Base (Navy #1), and the Gate II #38 Substation (Gate II Substation).

National Grid first identified a potential need to upgrade the 61 and 62 Lines to 115 kV in its 2007 Greater Rhode Island Transmission Reinforcement Study (GRI Study), which addressed transmission system needs between 2007 and 2020, in an area encompassing the state of Rhode Island and selected areas in Southeastern Massachusetts. The GRI Study offered a series of near term recommendations for reinforcing the area transmission system. Some of these recommendations (e.g., the construction of a new 345-115 kV substation in Plainville, MA) were implemented; others were deferred for further study by ISO-NE.

In March 2011, an ISO-NE Working Group launched a transmission planning study for the Southeastern Massachusetts (including Cape Cod) – Rhode Island (SEMA-RI) area. The Working Group included the Somerset/Newport Area, including the transmission facilities at the Dexter Substation in their study scope.

In February 2013, National Grid's Transmission Planning received a request to evaluate the impact of the ultimate design for the proposed 69/13.8 kV sub on the city of Newport, RI on the transmission system.

In June 2013, ISO-NE indicated the completion of the SEMA-RI study would be delayed by another year. Given the request to evaluate the impact of proposed Newport substation and the identified needs, National Grid requested to separate and advance the solution for Dexter Substation and the transmission facilities supplying Aquidneck Island. ISO-NE agreed with National Grid advancing the solution for Aquidneck Island.

National Grid conducted a stand-alone review of the transmission system serving Aquidneck Island in 2014. This study modeled the thermal and voltage performance of the transmission system local to Aquidneck Island in the year 2022, based on the Capacity, Energy, Loads and Transmission (CELT) 2013 forecast of summer peak electric loads from the ISO-NE CELT Report. This forecast incorporates (1) projected demand response that has cleared in the forward capacity market (FCM), and (2) ISO-NE's ten-year forecast of energy efficiency in New England. The study also assumed that certain projects planned for the larger SEMA-RI area would be in place by 2022.

The Aquidneck Island Study identified potential thermal overloads under N-1 contingency scenarios at the Dexter Substation, on the 61 and 62 Lines, and at the Jepson Substation. Specifically, and from north to south:

- If either the 56 MVA paralleled transformers or the 100 MVA transformer at Dexter Substation are out of service, the remaining 115/69 kV transformer(s) at

Dexter Substation could overload. These transformers are the sole supply of electricity to Aquidneck Island south of the Dexter substation. The need to resolve this potential overload is 2016.

- If either the 61 or the 62 Line is out of service, the remaining 69 kV line could be loaded beyond its thermal capacity. The need to resolve this possible overload is immediate.
- If either of two breakers at the Jepson Substation is out of service, the 69 kV ring bus at Jepson Substation could overload. The need to resolve this possible overload is immediate.

If any of these scenarios occur during summer peak loading conditions, National Grid would be forced to reduce the demands on the transmission system by shedding load – that is, by dropping electric service to some Aquidneck Island electric customers until the out-of-service equipment is repaired, or until electric demand drops sufficiently to allow the Company to serve all of its customers with its remaining equipment.

Thermal overloads under N-1 contingencies and applicable N-1-1 contingencies are unacceptable under National Grid, ISO-NE, NPCC and NERC standards. In addition, National Grid does not regard shedding of load as an acceptable long term solution to design criteria violations, and recommendations will be made to construct adequate facilities to maintain system reliability without shedding load. The Aquidneck Island Study therefore analyzed alternative solutions to these issues, and recommended that the 61 and 62 Lines between the Dexter and Jepson Substations be upgraded to 115 kV. The alternatives analysis is discussed in more detail in Section 5.

3.3.2 Jepson Substation Asset Condition Studies

National Grid has reviewed the physical condition of the Jepson Substation three times within the past decade: in 2005, in 2011, and in 2013. Each study recommended upgrading and/or replacing equipment in the 4 kV, 23 kV and 69 kV yards, due to failure history or a lack of available spare parts and technical support. Major asset condition issues at the Jepson Substation include:

- The 69 kV breakers are 50 and 60 years old and have air systems that have not functioned reliably in the past.
- Four of the 23 kV breakers are over sixty years old, and three additional 23 kV breakers are over 40 years old. It is increasingly difficult to obtain parts and technical support for this equipment, particularly for the oldest breakers.

- The 69 kV structure has pin-type insulators, which have a higher failure rate than other insulator designs. Additionally, this structure has an older style switch for which replacement parts are no longer available.
- The 23 kV bus also uses approximately 100 pin type insulators. Furthermore, the arrangement of this bus has substandard clearances and working space per current standards.
- The 23 kV bus voltage is regulated by an obsolete Load Tap Changer parallel control scheme. This scheme consistently produces voltage problems and at times, has been disabled.
- The sixty-year-old control house is in acceptable condition. However, there is insufficient space within the control house to add a failure scheme for the current 69 kV ring bus or to upgrade obsolete remote terminal unit (RTU) equipment.
- Secondary oil containment for three transformers does not meet current standards.
- The 4 kV Yard contains 1960's vintage 23/4.16 kV station with mostly original equipment. Obsolete design with single set of regulators supplying both feeders. The entire bay no longer meets current clearance requirements.

In addition to these documented issues, a portion of the Jepson Substation is located within Portsmouth's "A" Zone Watershed Protection District and is proximate to Sisson Pond, a water supply reservoir. While it is possible to operate and maintain the existing substation in this location, it is not an ideal location for new substation equipment.

3.4 Conclusions

The Aquidneck Island Study demonstrates that the existing transmission facilities on Aquidneck Island are inadequate to meet National Grid, NERC, NPCC, and ISO-NE reliability standards and criteria for the projected load and generation conditions in this area. These problems become increasingly more severe as peak load continues to grow.

In addition, the Jepson Substation Asset Condition Studies demonstrate that equipment at the Jepson Substation is aging or obsolete, and replacement parts are difficult to obtain. The existing control house is not large enough to accommodate required equipment upgrades.

The studies demonstrate a need to construct new transmission facilities to improve the reliability of the transmission system serving Aquidneck Island. The Company proposes the following investments to address the transmission reliability problems:

- Rebuild and upgrade the 61 and 62 Lines from 69 kV to 115 kV between the Dexter and Jepson Substations.
- Relocate the Jepson Substation to a new site and rebuild it at 115 kV to address both asset condition and reliability issues.
- Reconfigure the Dexter Substation to accommodate the upgraded 61 and 62 Lines.

Given the lead times necessary for permitting and other pre-construction activities, as well as the time required for construction itself, these problems constitute needs that must be addressed immediately.

4.0 Proposed Action and Project Description

4.1 Introduction

In this section of the ER, the overall scope of the Project is identified, and the individual components of the Project are described. This section of the ER 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:

- To rebuild and upgrade the existing 69 kV 61 and 62 Lines to 115 kV between Dexter Substation and Jepson Substation.
- To replace the existing Jepson Substation at Jepson Lane in Portsmouth with a new substation facility on the west side of Jepson Lane in Middletown which requires the relocation of a segment of the 63 Line.
- To decommission the old Jepson Substation.
- To reconfigure Dexter Substation by adding 115 kV load break switches, new dead end structures, and circuit switcher and removing the 115/69 kV transformation and the associated 69 kV equipment.

The Project will reinforce the existing transmission system on Aquidneck Island. The new Jepson Substation will provide enhanced capacity to supply Aquidneck Island, including the existing 69 kV line, and the 23 kV and 13.8 kV distribution feeders. As an ancillary benefit, the reinforcement will facilitate the retirement of four 23 kV/4 kV substations in the area (Bailey Brook, Vernon, North Aquidneck, and South Aquidneck). The general locations and routes of the proposed transmission system additions and reinforcements are shown in Figures 2-2 and 2-3.

4.1.1 Dexter to Jepson 69 kV to 115 kV Transmission Line Upgrade

TNEC is proposing to rebuild the two existing 69 kV 61 and 62 Lines and upgrade them to 115 kV on the existing ROW between the Dexter Substation located off Freeborn Street in Portsmouth and terminating at the new Jepson Substation off Jepson Lane in Middletown, a distance of approximately 4.4 miles (the 61/62 Line Upgrade Project.[5]) The 61 and 62 Lines are parallel 69 kV transmission lines in Portsmouth that were originally built in the 1950s, and partially rebuilt in the 1980s and early 2000s.

The Project ROW is 100 feet wide. The ROW topography is generally flat, slightly sloping in a southerly direction, and traverses rural/suburban areas.

Structures are either single circuit wood H-frame structures installed in the early 2000s or double-circuit wood 3-pole structures installed in the 1950s and 1980s. A 13 kV distribution circuit is located generally on the western side of the ROW, from Dexter Substation to Structure 117 in the Green Valley Golf Course in Portsmouth. The existing conductor is 636 MCM AAC 37 strand "Orchid". The existing shieldwire is 3/8 inch High Strength Steel.

A total of 69 wood structures (44 single circuit and 25 double circuit) ranging in height between 45 and 65 feet will be removed and replaced with a total of 92 new single circuit steel structures ranging in height between 86 and 96 feet. All replacement structures will be single pole, single circuit, steel poles on concrete caisson foundations with davit arms facing inward towards the centerline of the ROW. In addition to the 92 replacement structures, three additional new double circuit structures ranging in height between 96 and 106 feet will be installed to extend the lines from the existing Jepson Substation site to the new termination at the relocated Jepson Substation. Figures 4-1 and 4-2 provide a cross sections of the typical single circuit structures. Figure 4-3 provides a typical cross section of a double circuit structure.

The entire length of both lines (4.4 miles for each circuit) will be reconductored and the shieldwire replaced. The conductor will be 795 kcmil ACSR (Aluminum Conductor Steel Reinforced) "Drake". Optical Ground Wire (OPGW) will be installed on the 61 Line and 3/8" Extra High Strength (EHS) steel shieldwire will be installed on the 62 Line. All new insulators and hardware will be used. The new circuit length will be approximately 4.5 miles, which includes a 0.1 mile extension to the new Jepson Substation.

5 Following the construction of the Project, the Lines will be designated M13/L14.

4.1.2 Temporary Realignment of 63 Line Near Jepson Substation

In order to build the new Jepson Substation on the west side of Jepson Lane, TNEC must relocate a segment of the 63 Line. Prior to construction of the new Jepson Substation, a segment of the 63 Line will be temporarily re-routed around the northern boundary of the proposed substation site to ensure worker safety during construction of the new substation. The re-routed line will be supported by one guyed single wood pole that will be approximately 79 feet in height. Once the new Substation is operational the 63 Line will exit the westerly side of the station and be reconnected with the existing 63 Line to the west. After the 63 Line is connected with the new Jepson Substation, the segment north and east of the substation will be removed and the associated cleared areas will be restored with native tree and shrub plantings.

4.1.3 Relocated Jepson Substation

Due to physical limitations of the existing Jepson Substation site, as well as environmental and constructability concerns, TNEC is proposing to relocate the substation to a new site on property owned by TNEC on the west side of Jepson Lane in Middletown, proximate to the existing substation. As with the current substation, the new Jepson Substation will be an unmanned station.

This proposed substation will be supplied by the upgraded 61 and 62 Lines. The proposed layout of the new substation on Jepson Lane is depicted on Figure 2-3 and includes:

- Three bays of 115 kV rigid bus structures, 115 kV circuit breakers, switches, insulators, and buses.
- Two 115 kV steel pole terminal structures.
- Two 115 kV circuit switchers.
- Two 115/13.8 kV 40 MVA power transformers.
- Two 115/23 kV 55 MVA power transformers.
- One 115/69 kV 100 MVA auto transformer.
- One 15 kV Metal-clad Switchgear Power & Control Center (MCSPCC).
- One 23 kV MCSPCC.
- Two 10.4 MVAR 23 kV capacitor banks.
- Two 7.2 MVAR 13.8 kV capacitor banks.

- Miscellaneous substation equipment.
- Yard lighting.

The ultimate arrangement allows for two future 115 kV connections into the substation and future 115 kV capacitor banks.

The new substation will be constructed within a 3.1 acre fenced area measuring approximately 360 feet by 390 feet on the west side of Jepson Lane. Two new driveway entrances will be constructed to the substation from Jepson Lane. Additionally, access for the 37K33 distribution line and the 63 Line will be provided by a new gravel roadway around the northwest perimeter of the new substation.

4.1.4 Dexter Substation Modifications

As a result of the upgrade of the 61 and 62 Lines, Dexter Substation will be reconfigured to 115 kV operation and the 115 kV/69 kV transformation and associated 69 kV equipment will be removed. TNEC is proposing the following modifications at Dexter Substation:

- Installation of two motorized disconnect switches.
- Installation of two 115 kV dead end structures.
- Installation of one 115 kV circuit switcher.
- Removal of two 115 kV/69 kV 56MVA transformers.
- Removal of one 115 kV/69 kV 112 MVA transformer.
- Removal of five 115 kV circuit switchers.
- Removal of three 69 kV oil circuit breakers, associated 69 kV switches and buswork.

In order to accommodate the modifications to Dexter Substation and reduce the number of required outages, TNEC will temporarily relocate the 115 kV M13/L14 Lines.

4.2 Overhead Transmission Line Construction Practices

The rebuild of the existing 61 and 62 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 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 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.

- 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.

4.2.1 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. Wetland flagging will be refreshed as needed following vegetation maintenance.

4.2.2 Installation of Best Management Practices

Following ROW mowing and vegetation maintenance activities, appropriate erosion control devices such as straw bales, straw wattle, compost mulch tubes and siltation fencing, 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 swamp mats. Swamp 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. Swamp mats will be installed in a manner so as to not impede water flow. Such temporary swamp 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. Vegetation will not be permanently affected by the installation of these mats.

All work is to be in conformance with National Grid Environmental Guidance document EG-303NE, ROW Access, Maintenance and Construction Best Management Practices (EP No. 3 – Natural Resource Protection (Chapter 6), dated August 29, 2014).

4.2.3 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 are suitable in a majority of the work areas. In some cases, existing access roads will require maintenance 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 swamp mats and/or swamp mat bridges as described in Section 4.2.2.

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. As part of the Project, it will be necessary to remove some segments of stonewalls and when possible these will be restored following construction.

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 swamp mats in locations where temporary access across wetland areas is proposed. Throughout the Project, pick-up trucks will be used to transport crews and hand held 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.

4.2.4 Installation of Foundations and Replacement of Structures

As noted in the Project Description (Section 4.1.1), 92 single circuit steel transmission structures will be installed to replace the existing 69 wood structures (44 single circuit and 25 double circuit) and three new double circuit steel transmission structures will be installed to extend the lines from the existing Jepson Substation to the new Jepson Substation. 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 foundations for new structures. Grading 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 structures will be installed on concrete foundations. These foundations will range from approximately 10 to 50 feet in depth and 5 to 10 feet in diameter. 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.

4.2.5 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 swamp 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 at non-wetland locations to mount stringing blocks on the structures. Pickup trucks will be used to transport work crews and small materials to work sites.

4.2.6 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.

4.2.7 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 National Grid 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 and obligations prior to the start of construction. Regular construction progress meetings will reinforce the contractor's awareness of these issues.

4.2.8 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.

4.2.9 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 using selective application of herbicides, and by hand or mechanical cutting. Herbicides will continue to be applied by licensed applicators to select target species. Herbicides are never applied in areas of standing water or within proximity to residences, within designated protective buffer areas associated with wells, surface waters, and agricultural areas.

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.

4.3 Jepson Substation Construction Practices

As part of the Project, TNEC proposes to build a new substation on property owned by the Company on the west side of Jepson Lane. This property includes ROWs for transmission and distribution lines associated with the existing substation. The construction of the new Jepson Substation would be accomplished using standard site development and substation construction techniques.

4.3.1. Site Clearing and Best Management Practice Installation

Prior to any construction, the limit of disturbance will be surveyed and staked in the field, and the wetland flagging will be refreshed. In order to safely perform the site work, the existing 69 kV 63 Line will be relocated on the property around the new substation yard. Since the substation will be built on a managed right of way, vegetation clearing consists of shrub and sapling removal at the station site. Mature tree clearing of approximately 0.31 acres is required for the temporary 63 Line re-routing. This area will not be grubbed so vegetation can reestablish once the temporary line is removed.

Once the vegetation removal is complete, soil erosion and sediment controls will be installed along the proposed limit of disturbance. Soil erosion control and other engineered stabilization measures will be provided along the down gradient side of the work area to protect adjacent resource areas from sediment migration during grading operations. Crushed stone tracking pads will be installed at the entrances to the existing and new substation yards to minimize equipment tracking of dirt onto the local roadway.

Stumps and unsuitable overburden will be removed from within the station area. The excess soil and will be properly disposed of at an offsite location.

4.3.1.1 Yard Construction

The new station yard will be constructed to dimensions of approximately 360 feet in width and 390 feet in length. Due to the slope of the site away from Jepson Road, structural fill will be imported to establish the desired grade elevation for the substation equipment. Grading and sloping along the perimeter of the station yard will extend beyond the limits of the proposed fence line to the north and south. A retaining wall will be constructed along the west side of the yard to minimize wetland impacts.

The imported fill will be a clean processed gravel to minimize runoff and promote infiltration of rainfall. The station yard will be enclosed in a chain link perimeter security fence topped with barbed wire. The yard will be surfaced with 6 inches of crushed stone aggregate to enhance grounding safety and drainage. Two paved access drives will be installed off Jepson Lane. A paved driveway will be installed within the yard to provide access to the new control building and equipment.

4.3.1.2 Yard Equipment

Within the substation yard, a number of concrete foundations and steel and aluminum structures will be installed to support the electrical equipment as described in Section 4.1.2. In addition, a 40-foot wide by 90-foot long building will be installed to house equipment controls. Runoff from the building roofs will be infiltrated in the stone surface of the switching station yard. Underground duct banks will be constructed from the station to distribute electricity at 13 kV and 23 kV voltages. These duct banks will connect to existing overhead 13 kV and 23 kV lines east and west of the new station.

4.3.1.3 Rehabilitation of Impacted Areas

All disturbed upland areas impacted by construction of the new Jepson Substation will be stabilized with stone rip-rap, seeded with grass, or landscaped as appropriate. Topsoil stripped from initial vegetation removal activities will be stockpiled on the site and used as appropriate in areas where vegetation is to be established. Impacted upland areas will be stabilized with a New England conservation/wildlife seed mixture, or equivalent. Areas temporarily impacted within wetlands will be re-graded to establish pre-construction contours and seeded with a New England "Wetmix" or equivalent. The area cleared for the temporary transmission relocation will be re-vegetated with deciduous and evergreen saplings to match existing vegetation type. Wetland restoration and a landscape plan will be developed to mitigate permanent and temporary construction-related wetland impacts.

Landscape screening will be installed on the south side of the Site and along portions of Jepson Lane. The existing stone wall along the road will be maintained except in the area of the two driveway curb cuts. The substation fence will be set back from the road to allow for landscape planting areas along Jepson Lane in areas where there are no overhead lines. On the southern side of the substation, a segment of the existing overhead distribution lines adjacent to the abutting homes will be removed. Where this overhead distribution line is removed, an earthen berm ranging in height from four to eight feet will be constructed to provide more effective landscape plantings for the southern abutters. In addition, a 20-foot textured concrete screening wall will be installed along the southern and southwestern limits of the substation. North of the substation there is existing tree and shrub vegetation. Some of this natural screening will be removed to allow for the temporary 63 Line relocation. The cleared area will not be grubbed so TNEC can re-vegetate this area after construction. An undisturbed vegetative buffer ranging in width between approximately 30 to 80 feet will be retained in its natural state along the northern property line. After removal of the temporary 63 Line, the cleared area will be planted with native tree saplings in irregular patterns and clustered groups.

4.3.1.4 Retirement of Existing Jepson Substation

After energization of the new substation, the existing substation equipment will be removed. The existing substation equipment will be sent for processing at a recycling facility. Materials that are not salvageable will be disposed of off-site and in compliance with applicable regulations.

The fence will be removed, the yard graded, and the area stabilized with loam and seed. The area will continue to be used as a ROW for overhead transmission and distribution lines and managed accordingly under the Company's Vegetative Management Plan.

4.4 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.

Following construction of the facilities, all transmission structures and substation facilities will be clearly marked with warning signs to alert the public of potential hazards if climbed or entered.

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

4.4.1 Hazardous Substances

A potential hazardous substance to be used at the new substation is battery acid, which is contained in the control house batteries. Battery acid is toxic and corrosive. There are three levels of containment provided. Battery acid is contained in solid battery pack cases, a shallow berm surrounds the battery pack area, and lastly the battery packs are housed inside the control building. In the unlikely event of a leak of acid from batteries, the leak will be contained by the berm until it is cleaned up. Hydrogen gas from a leaking battery will be detected by sensors. If hydrogen gas reaches a two percent concentration, alarms are sounded in the National Grid control center and personnel will respond.

Sulfur hexafluoride (SF_6) will also be used in the new substation. SF_6 is defined as hazardous by the U. S. Department of Transportation (USDOT). SF_6 is a colorless, odorless and nonflammable gas used as an insulator in the 115 kV circuit breakers. It is commonly used in lieu of insulating oil. When gas insulated equipment is used outdoors, as proposed at the new Jepson Substation, the concentration of any release would be insignificant when dispersed in the atmosphere.

Although SF_6 is defined as hazardous by USDOT, there is no risk of general public exposure because the switches are located inside the fenced substation yard. The breakers are installed and maintained by trained technical staff and they are checked for integrity during inspections by National Grid personnel.

4.5 Project Community Outreach

TNEC believes in an open, transparent and regular two-way dialogue with project stakeholders throughout the life of its projects. In January 2015, TNEC launched a comprehensive campaign to educate and inform neighborhood residents, municipal officials, businesses, and the Aquidneck Island community about the full scope of work to be undertaken to support the Aquidneck Island transmission and distribution systems, and more specifically to provide information about the Project. This campaign includes:

- Open House events held in February 2015.
- Community webinar held in March 2015.
- A user-friendly, interactive website.
- A Project hotline.
- Fact sheets, door hangers, visual simulations, FAQs, timelines, etc.
- Social media outreach and media relations efforts.
- A Project video.
- Direct mailings, abutter meetings, and door-to-door outreach to property owners along the Project route.
- A Project Ombudsman who serves as a single point-of-contact for the public.

The TNEC 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.

4.5.1 Open Houses

TNEC held the first set of Project Open Houses on February 3rd in Middletown and February 7th 2015 in Portsmouth. These Open Houses 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. To reach community members unable to participate in the open houses, TNEC held an online webinar on March 24th 2015, allowing all stakeholders on Aquidneck Island to learn more about the Project and ask questions of the Project team members. Project representatives participated in a November 3rd 2015 National Grid Community

Connections event for Aquidneck Island residents, businesses and community members, providing Project information and answering questions.

4.5.2 Project Website

A Project website is available at OnIslandNGRID.com. This website provides Project information, including background, updates, and contact resources. TNEC will keep the website up-to-date for the duration of the Project. A dedicated email address – onisland@nationalgrid.com – is also available for interested parties to send questions or comments. The Project Email is listed in all Project outreach materials including fact sheets, mailings, the website, social media, and signage at community events.

4.5.3 Twitter

TNEC engages the public through social media using Twitter (@OnIslandNG), allowing for a 24-7 information share on the Project. The Project twitter feed will allow TNEC to provide real-time construction and traffic updates for those who follow the feed.

4.5.4 Media Relations/Advertising

TNEC has placed several advertisements – print and digital – in local daily and weekly publications to announce Project events, including open houses, webinar, etc. In addition, several articles about the Project have appeared in local publications.

4.5.5 Project Video

TNEC created and released a video that details the Project components and engages team members, local elected officials and residents to provide feedback and commentary on the Project. This video is available on our Project website.

4.5.6 Project Hotline

A toll free number (800-568-4558) and a local number (401-400-5862) have been designated as the Project Hotline for the AIRP. The Project Hotline numbers are listed in all Project outreach materials including fact sheets, mailings, the website, social media, and signage at community events.

4.5.7 Abutter Meetings

Since January 2015, TNEC representatives have individually met with several Project abutters in Portsmouth and Middletown to answer questions specific to their particular properties. These visits will continue through the life of the Project.

4.5.8 Door-to-Door Outreach

In June 2015, TNEC engaged in a door-to-door outreach campaign, canvassing all residents and business adjacent to the various Project activities in Portsmouth and Middletown. Team members provided information and answered questions when a contact was made, and left materials at the door when contact was not realized.

4.5.9 Construction Communication Plan

Building off the existing outreach and communications plan, TNEC 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 Project website, hotline, email and twitter account, this plan will include, as needed, work area signage; construction notifications; and direct contact with Project abutters.

TNEC's Project Ombudsman will be responsible for coordinating outreach during construction and serving as a single point of contact for the public. The Project website will be kept up-to-date throughout Project construction. Project information also will be communicated through various town and businesses websites as permitted.

4.6 Project Costs

4.6.1 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. Since the Project involves the rebuild of existing lines, any increase in operation and maintenance costs should be negligible. Annual operation and maintenance activities for the Jepson Substation include routine inspections and functional testing and adjustment of the electrical equipment. Since the existing Jepson Substation, as well as other smaller stations, will be removed, the Company does not anticipate any increase in operation and maintenance costs.

4.6.2 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 2014 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 4-2.

Table 4-1 Estimated Project Costs (Millions)

Project Components	Estimated Cost
61 and 62 Line Upgrades	$22.70
New Jepson (D Sub) and Retirements	$24.10
New Jepson 115kV (T Sub)	$13.20
Dexter 115 kV (T Sub) Upgrades	$3.90
Total Estimated Project Cost	$63.90

4.7 Project Schedule

TNEC has developed a preliminary schedule based on time duration estimates of Project permitting and licensing, detailed engineering, materials acquisition, and construction (Figure 4-4). The 61/62 Line Upgrade Project is expected to be completed by January 2019 and the new Jepson Substation is expected to be in service by September 2019.

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5.0 Alternatives to the Proposed Action

5.1 Introduction

The Company's foremost concern in developing the Project was to ensure that the plan selected to meet Aquidneck Island'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 identified to address transmission system needs on Aquidneck Island. Initially, four "planning alternatives" were evaluated including a no-build alternative, a 69 kV alternative, a 115 kV alternative (the Project), and a non-wires alternative. These alternatives are described in Section 5.2, which concludes that the 115 kV alternative best meets system needs while minimizing cost and environmental impacts. Section 5.3 evaluates routing and configuration alternatives for the 61/62 Line Upgrade Project, including reuse of the existing ROW, an alternative route along West Main Road, an alternative route along East Main Road, and two underground alternatives. Section 5.4 evaluates alternative locations and configurations for the new Jepson Substation, including reuse of the existing site, construction on the west side of Jepson Lane, construction spanning Jepson Lane, construction between West Main Road and Jepson Lane, and two agricultural parcels.

5.2 Planning Alternatives

5.2.1 No Build Alternative

The No Build Alternative would be to continue to serve Aquidneck Island electric customers without upgrades to the island's existing electric transmission system.

If the No Build Alternative is pursued, the 61 and 62 Lines and equipment at the Jepson and Dexter Substations could become thermally overloaded under certain contingency scenarios during summer peak conditions. In response, TNEC would be forced to reduce demand on the transmission system by dropping electric service to customers on Aquidneck Island until the out-of-service equipment causing the contingency scenario is repaired, or until the electric demand drops sufficiently to allow the Company to serve all of its customers with its remaining equipment. In addition, asset condition issues at the existing Jepson Substation would not be addressed, further degrading the reliability of electric service on Aquidneck Island.

Because of the potential for equipment overloads that would require TNEC to drop customers to protect the transmission system, and in light of the numerous existing asset condition issues at the Jepson Substation which also degrade electric system reliability, the No Build Alternative is not an acceptable means of maintaining a firm and reliable electric supply on Aquidneck Island.

5.2.2 Rebuilding and Upgrading the 61 and 62 Lines to 115 kV (Project) (Preferred)

As discussed in more detail in Section 4, the Project involves (1) upgrading the existing 69 kV 61 and 62 Lines between the Dexter and Jepson Substations to 115 kV; (2) relocating and rebuilding the existing Jepson Substation to address asset condition issues and support upgrades to the 61 and 62 Lines, and (3) removing the existing 115/69 kV equipment from the Dexter Substation to support the 61 and 62 Line upgrades. This Alternative was found to be superior to others considered for a variety of reasons as described in Section 3 and this section. Consequently it has been advanced as the preferred alternative.

Construction of the Preferred Alternative would address the reliability and asset condition issues outlined in Section 3 and support load growth on Aquidneck Island for the foreseeable future.

5.2.3 69 kV Alternative

The 69 kV Alternative would involve (1) reconstructing the existing 61 and 62 Lines at 69 kV, (2) relocating and rebuilding the Jepson Substation to address both asset condition and reliability issues, and (3) upgrading the Dexter Substation by reconfiguring the 115 kV and replacing the existing 115/69 kV transformers with four 115/69 kV transformers.

Construction of the 69 kV Alternative would address the reliability and asset condition issues outlined in Section 3. However, when compared to the preferred option (the immediate upgrade of the 61 and 62 Lines from 69 kV to 115 kV), this option results in less electric load growth capability on Aquidneck Island.[6] Thus the preferred option provides a more robust supply system able to accommodate a larger amount of future load growth.

5.2.4 Non-Wires Alternative

Where a transmission need has been identified, a non-wire alternative (NWA) such as energy efficiency, demand response, distributed generation, or any combination of the same may also be considered as an option to defer the transmission solution for a period of time.

TNEC evaluated the potential for an NWA that would involve adding sufficient demand-side resources (energy efficiency, demand response, and distributed generation) at strategic locations on Aquidneck Island to defer or eliminate the need for the Project. TNEC assessed the feasibility of this approach consistent with the criteria set forth in Section 2.1.D of the System Reliability Procurement Standards (SRP Standards), adopted by the Rhode Island Public Utilities Commission (RI PUC) on June 10, 2014. The SRP Standards state in pertinent part:

> D. Identified transmission or distribution (T&D) projects with a proposed solution that meet the following criteria will be evaluated for potential NWAs that could reduce, avoid or defer the T&D wires solution over an identified time period.
>
> 1. The need is not based on asset condition;
> 2. The wires solution, based on engineering judgment, will likely cost more than $1 million;
> 3. If load reductions are necessary, then they are expected to be less than 20 percent of the relevant peak load in the area of the defined need;
> 4. Start of wires alternative construction is at least 36 months in the future;
> 5. At its discretion the utility may consider and, if appropriate, propose a project that does not pass one or more of these criteria if it has reason to believe that a viable NWA solution exists, assuming the benefits of doing so justify the costs.

The proposed upgrade of the Jepson Substation is driven by asset condition issues and possible thermal overloads at the Jepson 69 kV ring bus which cannot be addressed through load reductions. TNEC therefore concluded that there is no feasible NWA for the Jepson Substation portion of the Project.

6 If the 69 kV Alternative were to be pursued, the limiting N-1 contingencies would be on the 115 kV equipment at Dexter Substation.

TNEC next identified the load reductions that would be required on Aquidneck Island to address the possible thermal overloads driving the need to upgrade the 61 and 62 Lines. In making these calculations, TNEC assumed that conductor clearance limitations on the 61 and 62 Lines would be removed. TNEC determined that:

- In 2014, 23 MW of load reductions at the Gate II and Navy No. 1 Substations would be needed to address the possible N-1 contingency thermal overloads on the 61 and 62 Lines. Peak load for this area was approximately 63 MW. The required load reduction therefore is approximately 36% of the relevant peak load.
- In 2022, 24 MW[7] of load reductions at the Gate II, Navy and Newport substations would be needed to address the potential N-1 contingency thermal overloads on the 61 and 62 Lines. Peak load for this area is projected to be approximately 75 MW. The required load reduction is therefore approximately 32% of the relevant peak load.

An NWA for the 61 and 62 Line Upgrades clearly would fail criterion (3) of the SRP Standards. In addition, the construction start for the 61 and 62 Line Upgrades is less than the 36 months called for in criterion (4) of the SRP Standards. TNEC therefore concluded that an NWA for this portion of the Project would not be feasible.

While an NWA does not appear to be a feasible alternative for any portion of the Project, TNEC has previously implemented a targeted energy efficiency program on Aquidneck Island: the 2009-2010 Energy Action Pilot Program for Aquidneck Island and Jamestown. Between July 2009 and December 2010, TNEC conducted a community-based pilot program designed to increase energy efficiency savings from National Grid programs in Middletown, Newport, Portsmouth and Jamestown. The results of the Energy Action Pilot Program are analyzed in a report prepared by Opinion Dynamics Corporation and titled *Evaluation of National Grid's Community Pilot Program -- Energy Action: Aquidneck and Jamestown* (Final Report). The Final Report found that savings from commercial electric energy efficiency programs during the pilot program were 53% above what would have been expected in the absence of a pilot program. Residential electric savings were 12.8% above the levels that would have been expected in the absence of a pilot program. However, despite this extensive marketing of energy efficiency programs to commercial and residential customers on Aquidneck Island, electric demand continues to increase.

7 TNEC assumed that certain sub-transmission projects will be undertaken on Aquidneck Island, independent of the Project, between 2014 and 2022. As a result of these sub-transmission projects, the load reductions needed to address the Project need slightly increased between 2014 and 2022. However, the required load reductions would increase in later years as load growth continues on the island.

5.2.5 Conclusion on Planning Alternatives

For the reasons summarized in the previous sections, TNEC concluded that the 115 kV Alternative is preferable to the No Build Alternative, the 69 kV Alternative, and the NWA.

The No Build Alternative was dismissed because it would not address the reliability and asset condition issues identified in Section 3, and therefore is not an acceptable means of maintaining a firm and reliable electric supply on Aquidneck Island. TNEC was not able to identify a viable NWA to address either the reliability or the asset condition issues identified in Section 3, consistent with the RI PUC's SRP Standards.

The 69 kV Alternative could address the reliability and asset condition issues identified in Section 3, but it is less robust than the preferred option. In the future, TNEC would need to implement a variant of the 115 kV Alternative, including additional work on the 61 and 62 Line ROW, to address load growth on the island. This would result in additional environmental impacts and costs.

Because the 115 kV Alternative provides a longer term solution to the needs identified in Section 3, with comparable environmental impacts, TNEC determined to pursue the 115 kV Alternative.

5.3 Alternatives for the 61 and 62 Lines

5.3.1 Reuse Existing ROW (Proposed)

As discussed in more detail in Section 4, TNEC proposes to rebuild and upgrade the 61 and 62 Lines overhead within the existing ROW between the Dexter and Jepson Substations.

5.3.2 West Main Road Transmission Line Alternative

TNEC evaluated the option of constructing new overhead transmission lines that would run predominantly along West Main Road (Route 114), Union Street, and Jepson Lane in Portsmouth and Middletown between the Dexter and Jepson Substations (Figure 5-1). However, due to limited width along the roads, the lines would have to be constructed along one side of the road on tall double circuit steel pole structures supported on concrete foundations. There are concerns with this alternative including traffic impacts, property rights and clearance rights from abutters along West Main Road. These concerns caused TNEC to dismiss this alternative.

5.3.3 East Main Road Transmission Line Alternative

TNEC evaluated the option of constructing new overhead transmission lines that would run along East Main Road (Route 138) and Oliphant Lane in Portsmouth and Middletown between the Dexter and Jepson Substations (Figure 5-1). However, concerns similar to those noted above in Section 5.3.2, plus height restrictions associated with Federal Aviation Administration (FAA) Regulations related to the Newport State Airport, caused TNEC to dismiss this alternative. Due to the FAA Part 77 restrictions, one or more transmission "dips" would be needed along Oliphant Lane adding reliability concerns and additional construction costs.

5.3.4 Underground Transmission Line Alternatives

TNEC also examined underground alternatives to the proposed upgrade of the 69 kV 61 and 62 Lines (Figure 5-1). An underground alternative could address the upgrade requirements of the 61 and 62 Lines. However, there would be significant cost, schedule, environmental, and operational disadvantages to an underground alternative.

For the underground alternative, National Grid selected extruded dielectric cable as the preferred technology. Extruded dielectric cable consists of a conductor insulated with an extruded synthetic polymer material. At 115 kV, the insulation can be either cross-linked polyethylene (XLPE) or ethylene-propylene rubber (EPR). Additional layers consisting of a metallic shield, radial moisture barrier and a jacket are applied over the insulation, and then the individual cables are pulled into individual plastic conduits encased in concrete. Extruded dielectric cable has become the most common type of cable used for new transmission cable installations in the United States.

National Grid considered two underground cable routes between Dexter Substation and Jepson Substation: one using the existing overhead ROW, and one using the public roadway network. The routes are discussed in more detail below.

- <u>Existing ROW Route</u>: The underground ROW Route would follow the existing overhead transmission line ROW from Dexter Substation to the new Jepson Substation. The route is approximately 4.5 miles long, and traverses forested upland, wetland, residential neighborhoods and agricultural fields. The southern portion of the route crosses the Green Valley Golf Course and threads between Saint Mary's Pond and Sisson Pond through a forested ROW and then turns sharply east and crosses the southern portion of Sisson Pond and crosses Jepson Lane where it terminates at the new Jepson Substation. Special construction techniques, such as horizontal directional drilling, would be needed to cross the ponds with an underground route. The ROW Route is shown in Figure 5-1.

- Public Roadway Route: A representative underground route was developed using the existing public roadway network. This route would exit Dexter Substation onto Freeborn Street, proceed west on Freeborn Street to West Dexter Street, then south on West Main Road (Route 114) where it would turn east on to Union Street, then south on Jepson Lane to the Jepson Substation. The route is approximately 5.0 miles long. The representative roadway route is a reasonably direct connection between the two substations, but is not the result of an exhaustive analysis of possible cable routes. It is intended to provide a representative cost, and to address other issues associated with underground transmission lines. Other roadway routes would be expected to be approximately the same length, and have similar costs. For any underground roadway route, typical open trenching techniques would be used. The use of the public roadway network would create significant traffic impacts during construction of the underground duct bank system. The Roadway Route is shown in Figure 5-1.

Ampacity calculations determined that the circuit loading requirements can be satisfied with one cable per phase of 3000 kcmil copper conductor XLPE insulated 115 kV cable for each circuit. The two 115 kV underground circuits would be installed in a common concrete encased duct bank. The duct bank would consist of 6-inch PVC conduits for the 115 kV cables and smaller conduits for installation of ground continuity conductors and communications and control fiber optic cable. A typical trench cross-section is shown in Figure 5-2.

The conduits would be encased in 3000 pounds per square inch (psi) strength concrete to protect the conduits and cables from mechanical damage. The duct bank would be approximately 38 inches wide, and approximately 5 feet deep. The typical burial depth would be 30 inches to the top of the ductline concrete encasement. The presence of existing utilities and other subsurface obstructions along the route could cause these dimensions to vary along the route. Two precast concrete manholes would be installed approximately every 1,750 feet along the route for splicing of the cables. Separate manholes would be installed for each circuit so that in the event of a cable failure the companion circuit can continue to carry load while repair work is completed on the other circuit in the adjacent set of manholes. At the terminal ends, the cables would rise above ground at riser structures and terminate in the substation yard.

Conceptual cost estimates were prepared for both underground route alternatives. The conceptual cost estimates for the transmission line work required for each of the underground route alternatives are summarized below.

Table 5-1 Estimated Underground Construction Costs

Route	Estimated Cost (Millions)
ROW Route	$48.0
Public Roadway Route	$67.5

These costs do not include:

- Modifications to the terminal substations to accept underground transmission cables.
- Shunt Reactive compensation, if required.
- Property acquisition costs (if required).
- Rebuilding of the Jepson Substation (a common cost with the Project).

From a schedule perspective, the underground alternative would take several additional years to design, license and build.

In addition to the significantly higher costs and schedule impacts, there are a number of system and operational issues associated with underground transmission lines. These include:

- Lengthy Outage Repair Times: 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. The extended outage times for underground cables expose the remainder of the transmission system to emergency loadings for longer periods of time. There is also increased exposure to loss of another transmission element, with possible loss of load, during the extended underground outage.
- Cable Capacitance: Underground cables have significantly higher capacitance than overhead transmission lines, meaning that it takes reactive power (MVARs) to "charge up" the cable before the cable can transmit real power (MWs). This has several ramifications:
  - Part of the cable's capacity is used up by the charging current, so larger conductors are needed to transmit an equivalent amount of power. These have been included in the system design described above.
  - Capacitance can create voltage control problems, meaning that the voltage can get too high when the transmission system is at light load. If the 61 and 62 Lines were constructed underground, there would be approximately 11 MVAR of cable charging per cable, or 22 MVAR for the two circuits. The transmission system may be able to absorb this much capacitance, or it may

be necessary to install additional equipment, in the form of shunt reactors, at one or both terminal substations.

- Cable capacitance causes higher switching transient voltages on the system (voltage "spikes" during switching). This can damage other system components, may trigger the need to replace surge arresters throughout the area, and complicates future system expansions.

- Effect on Reclosing: Many faults on overhead lines are temporary in nature. Often it is possible to "reclose" (re-energize) an overhead line after a temporary fault, and return the line to service with only a brief interruption, measured in seconds. 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.
- Ratings: It is often difficult to match overhead line ratings with underground cables. It is also much more difficult to upgrade ratings on underground lines should that become necessary in the future.

Due to substantially higher costs, schedule risks, environmental impacts, and operational disadvantages, the underground alternatives were dismissed.

5.3.5 Underground Dips

During siting of overhead transmission lines, questions are often raised regarding the possibility of installing short segments of underground transmission line at discrete locations along the route. This type of short underground segment is often referred to as a "dip". The Company developed an estimated cost for a "generic" one mile underground dip for the proposed 61 and 62 115 kV Lines. This underground dip would utilize one set of 1,500 kcmil copper 115 kV XLPE cable per line, with each line installed in a dedicated ductline. The separated ductlines were chosen to reduce the possibility of a common mode failure, and allowed a smaller conductor to be used (as compared to the all underground plan). For a generic dip, the route would follow the existing ROW alignment.

At each end of the dip, there would be a transition station. This would be a fenced switching station, approximately 100 feet by 100 feet, and similar in appearance to an electrical substation. The transition station would terminate the overhead line, and would contain cable terminations, a control house, and accessory equipment. The cost of a one mile generic underground dip, utilizing similar assumptions as the underground alternative, is as follows:

Table 5-2 Estimated Generic Costs for a One-Mile Dip Segment

System Component	Estimated Cost (Millions)
Underground Cable	$16.2
Transition Stations (2)	$3.6
Total	$19.8

The average overhead transmission line cost along the route is approximately $5.2 million per mile. For a 1 mile dip, the underground line represents more than a four-fold increase in costs over the overhead line. An underground dip would expose the entire line segment to the underground transmission operational issues as discussed above. These include:

- Lengthy outage repair times for underground transmission cables.
- Effect on reclosing for temporary faults.
- Cable capacitance effects (less for dips).
- Ratings – potential for future bottlenecks.

Underground dips represent a large cost increase and introduce operational disadvantages when compared to the proposed overhead line.

5.3.6 Conclusion

For the reasons summarized in the previous sections, TNEC concluded that rebuilding and upgrading the 61 and 62 Lines to 115 kV on the existing ROW would be greatly preferred either to rebuilding the lines along West Main Road and East Main Road, or to constructing the upgraded lines underground.

5.4 Jepson Substation Site Alternatives

This section describes alternative sites and configurations for the new Jepson Substation.

A common challenge for these sites are the local watershed protection districts that are intended to protect the water supply. In Portsmouth there is the more restrictive "A" Zone that includes areas located within 500 feet of Lawton Valley Reservoir, St. Mary's Pond and Sisson Pond as well as areas of Stissing silt loam and Mansfield mucky silt loam. The less restrictive "UD" Zone includes areas outside of "A" Zone that are contributory via surface water runoff or groundwater movement. Similarly, the Middletown Watershed Protection District includes Zone 1 and Zone 2 (Middletown Zoning Ordinance, Article 11 §1102(A)(1)). The more restrictive Zone

"1" includes areas within 200 feet "from the centerline of a watercourse or the edge or bank of a surface water body or as otherwise shown on the official zoning map." Zone 1 also includes areas of Stissing silt loam and Mansfield mucky silt loam. Zone 2 is the watershed area which is contributory to surface water runoff to the primary water bodies contained in Zone 1, and which drains into Zone 1 areas either though surface water runoff or groundwater movement; it is delineated on the Middletown Official Zoning Map (2014). Although the existing substation is located within the more restrictive zone, the reuse of the existing substation property or any other parcel in the more restrictive zone could pose serious permitting challenges as a substation is not a permitted use in the more restrictive zones.

5.4.1 Re-Use Existing Jepson Substation Site

The first alternative considered for the new Jepson Substation was to rebuild the substation in its new 115 kV configuration at the existing site, on the east side of Jepson Lane (Option 1; Figure 5-3) in the area between the existing substation and Jepson Lane. The existing substation would have to remain in service while the new substation equipment was installed around it, resulting in complex construction sequence, multiple temporary line relocations outside the property limits, and outage schedules. This alternative was rejected as space limitations at the existing site made it impossible to accommodate the substation in its new configuration.

In addition to the size constraints, the existing site is within the watershed protection districts (WPD) for each town due to its proximity to the edge of Sisson Pond, a surface water supply reservoir for the Newport Water Department. Although spill prevention control and countermeasure (SPCC) facilities are used to protect against a release of mineral oil dielectric fluid (MODF) due to an unexpected equipment failure, the proximity of the pond makes the installation of these measures challenging. Due to the site grades sloping toward the pond and the limited available space, the SPCC measures at the existing Jepson Substation also retain water during rain events resulting in periods of standing water. This situation presents risks to the safety of TNEC employees.

Based on these issues, TNEC concluded that rebuilding the Jepson Substation at the existing substation site is not a viable option.

5.4.2 New Substation Site: West Side of Jepson Lane (Proposed)

The second alternative is to develop a portion of TNEC's 18 acre parcel of land located on the west side of Jepson Lane opposite the existing substation parcel (Option 2; Figure 5-3). The majority of the parcel is in Middletown with only the northeastern corner in Portsmouth. The parcel is large enough to accommodate the substation in its entirety and is already devoted to utility use with the 63 Line and distribution lines crossing it. Mother of Hope Brook crosses the middle of the parcel and separates developable areas on the east and the west sides of the brook. This alternative is to build the substation on the eastern side of the parcel between the brook and Jepson Lane. For the reasons summarized below, this alternative is the preferred site.

The parcel is shown on the Middletown zoning map as being located in Zone 2 of the M-WPD. However, it appears that the property lies outside the watershed protection district as Mother of Hope Brook and its contributing watershed west of Jepson Lane drain north to Narragansett Bay rather than south or east to any primary Zone 1 water bodies. Since the watershed boundary identified on the Zoning Map appears to be erroneous, for the purpose of this analysis TNEC assumed that the parcel is not within the M-WPD.

The property is across the street from the existing substation, so the transmission lines and distribution lines are located nearby. Where necessary, existing lines will be extended or realigned to connect to the new substation, but no additional easement rights are necessary.

As mitigation for the southern abutters to the substation, TNEC will install a 20 foot tall screening wall along the southern boundary and install plantings between the wall and the property line. The proposed mitigation also includes plantings along Jepson Lane and the northeastern corner of the substation property.

This alternative is the preferred site because of its size, proximity to existing transmission and distribution lines, and its location outside of the watershed protection districts.

5.4.3 Split Substation Site: Both Sides of Jepson Lane

The third alternative is a hybrid of the first and second alternatives as it uses both properties on Jepson Lane (Option 3; Figure 5-3). The 115 kV and 13 kV equipment would be located on the west side of Jepson Lane and the 23 kV equipment would be located on the east side of Jepson Lane in front of the existing Jepson Substation. This alternative effectively creates two substations. Although this alternative resolves the space constraints of the first alternative, it does present issues with the electrical protection design by having two substations in close proximity. The split configuration requires the transformers in the separate 23 kV yard to be tapped directly from the 115 kV transmission lines rather than from an integral bus system that would be used in the preferred alternative. This tap arrangement would require installing fiber communication along the 115 kV transmission lines to the existing equipment at the remote end of the transmission line. Underground conduit across

Jepson Lane would also be needed to connect the two stations. In addition to the protection requirements, this alternative has a greater visual impact as the equipment would be installed near the street line on both sides of Jepson Lane. Finally, due to the size constraints on the east side of Jepson Lane, the new equipment would be near the northern and southern property lines.

It was determined that this alternative presented too many challenges and provided no benefit over building one substation on the west side of Jepson Lane.

5.4.4 New Substation Site: Between West Main Road and Jepson Lane

The fourth alternative for the Jepson Substation would be to locate it on the far west side of the TNEC-owned parcel described in Section 5.4.2, in an upland area beyond the 100-foot Riverbank Wetland associated with Mother of Hope Brook that bisects the property (Option 4; Figure 5-3). This location would provide adequate space for the 23 kV and 115 kV equipment and avoid the flooding issues associated with the reuse of the existing substation site. However, access to the western portion of this lot is a challenge as it requires crossing Mother of Hope Brook or obtaining new access rights from Busher Drive or West Main Road. This location may also require additional easement rights to connect to the existing ROWs for the 63 Line and distribution line(s).

Another challenge for this location is mitigation of the visual impact as this site is located near densely developed residential areas to the west. Mitigating the visual impact will be difficult due to the limited vegetative buffer in the area and the number of homes that would be in close proximity to the substation.

This location could support the proposed substation as it has sufficient space for the proposed equipment as well as additional space to respond to future load demands. However, the site was rejected due to the access issues and the visual impacts of locating the substation near the dense residential developments.

5.4.5 New Substation Site: Lots 22 and 26 (Portsmouth)

At the request of Middletown Town Council, Lots 22 and 26 on Plat 60 in Portsmouth were reviewed as potential alternative locations for the new substation (Option 5; Figure 5-3). Lot 22 is located on Jepson Lane just north of the existing substation. Lot 26 is located to the east of Sisson Pond and the Project ROW runs along the northwestern boundary of the parcel. These sites are not owned by TNEC but are listed for sale. Both parcels are subject to Agricultural Land Preservation Restrictions with the Rhode Island Agricultural Lands Preservation Commission that requires the demonstration of “extreme need” and the “lack of any viable alternative” before the restriction could be lifted. This is such a significant obstacle that Lots 22 and 26 were ruled out.

5.4.6 Conclusion on Jepson Substation Site

Due to limitations of the first, third, fourth, and fifth alternatives, TNEC proposes to locate the rebuilt Jepson Substation on the east side of the TNEC-owned parcel in Middletown west of Jepson Lane.

5.5 Conclusion

TNEC has evaluated multiple plans to address electric reliability and asset condition needs on Aquidneck Island, including a No-Build Alternative, a 69 kV Alternative, a 115 kV Alternative (the Project), and a Non-Wires Alternative. The Company has also evaluated routing and design alternatives for the upgraded 61 and 62 Lines and alternate locations for a rebuilt Jepson Substation. Based on the analysis above, TNEC has determined the rebuilding the 61 and 62 Lines at 115 kV overhead within the existing ROW, and rebuilding the Jepson Substation on a new site on the west side of Jepson Lane, is superior to the alternatives considered. Construction of the Project as proposed will allow TNEC to continue to provide reliable electric service to its Aquidneck Island customers at reasonable cost and with minimal environmental impacts.

6.0 Description of Affected Natural Environment

This section of the ER 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 has been prepared. The following section describes the specific natural features which have been assessed for the evaluation of impacts and the preparation of 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.

6.1 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 one mile wide corridor centered on the existing Project ROW that extends from the existing Dexter Substation to the new Jepson Substation (refer to Figure 6-1). The boundaries of this corridor were determined to allow for a detailed inventory of existing conditions within and adjacent to the Project ROW.

6.2 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. Aquidneck Island in particular enjoys a moderate climate due to its close proximity to the Narragansett Bay which helps to minimize extreme temperatures (City of Newport, 2004). Although the Bay has a modifying effect, 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 Aquidneck Island, 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; City of Newport, 2004). 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 2012 Rhode Island Climate Change Commission Report, the average air temperature in Rhode Island has increased by 1.7 degrees Fahrenheit from 1905 to 2006 and the temperature in Narragansett Bay has risen by 4 degrees Fahrenheit at the surface 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).

6.3 Geology

6.3.1 Bedrock Geology

The Study Area is located 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).

From the Dexter Substation to a distance of approximately one-half mile south, an additional bedrock type known as the Narragansett Bay Group - Purgatory Conglomerate (Pennsylvanian Age) is present (Hermes et al. 1994). The primary rock type in this area is conglomerate, a coarse-grained clastic sedimentary rock, composed of rounded to subangular fragments larger than 2 mm in diameter typically containing fine-grained particles in the interstices, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay (Hermes et al. 1994).

6.3.2 Surficial Geology

The present landscape of Aquidneck Island, 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 northern 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. Glacial outwash deposits are not common in the Study Area and are mostly limited to the vicinity of larger streams occupying valley bottoms.

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 6-2.

6.3.3 Geological Hazards

Geological hazards, such as earthquakes or fault zones, could have negative impacts on transmission lines or substations. Rhode Island is located 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 (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).

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). 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). Earthquakes occur infrequently in Rhode Island and surrounding New England and therefore present a minimal risk for the design life of the Project.

6.3.4 Sand and Gravel Mining

Although mining activities occur on Aquidneck Island, there are no quarries or regulated facilities located in the Study Area, likely due to the unsuitable surficial geology of the area.

6.4 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[8], 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 11 named soil series have been mapped within the Study Area. Table 6-1 lists the characteristics of the 15 soil phases (lower taxonomic units than series) found within the Study Area. Figure 6-3 depicts soil classes grouped by erodibility hazard and hydric soil presence.

Table 6-1 Soil Phases within Study Area

Soil Map Unit Symbol	Soil Phase	Acres	Drainage Class	Percent Slope
Bc	Birchwood sandy loam	16.6	mwd	0 to 3
BrB	Broadbrook silt loam	75.1	wd	3 to 8
CeC	Canton and Charlton-fine sandy loams, very rocky	28.4	wd	3 to 15
Ma	Mansfield mucky silt loam	74.6	vpd	0 to 3
NeA	Newport silt loam	391.8	wd	0 to 3
NeB	Newport silt loam	1,198.6	wd	3 to 8
NeC	Newport silt loam	26.0	wd	8 to 15
NP	Newport urban land complex	115.1	wd	1 to 15
PmA	Pittstown silt loam	170.3	mwd	0 to 3
PmB	Pittstown silt loam	218.5	mwd	3 to 8
Sb	Scarboro mucky sandy loam	1.5	vpd	0 to 3
Se	Stissing silt loam	387.1	pd	0 to 3
Sf	Stissing very stony silt loam	8.8	pd	0 to 3
UD	Udorthents	79.2	mwd to ed	0 to 15
Ur	Urban Land	15.2	mwd to ed	0 to 10

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)

8 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, 2014].

6.4.1 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).

6.4.1.1 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.

6.4.1.2 Broadbrook Series

The Broadbrook series is classified as coarse-loamy, mixed, mesic Typic Fragiochrepts. These well drained soils were formed in a silt mantle over compact glacial till derived mainly from schist, gneiss, and phyllite. The soils are on side slopes and crests of drumlins.

6.4.1.3 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.

6.4.1.4 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.

6.4.1.5 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.

6.4.1.6 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.

6.4.1.7 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.

6.4.1.8 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.

6.4.1.9 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.

6.4.1.10 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.

6.4.1.11 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.

6.4.2 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 6-2. 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 6-2 USDA Prime Farmland Soils within the Study Area

Soil Map Unit Symbol	Name	Percent Slope
Bc	Birchwood sandy loam	0 to 3
BrB	Broadbrook silt loam	3 to 8
NeA	Newport silt loam	0 to 3
NeB	Newport silt loam	3 to 8
PmA	Pittstown silt loam	0 to 3
PmB	Pittstown silt loam	3 to 8

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

6.4.3 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 6-3 lists soil units designated as farmland soils of statewide importance that are found within the Study Area. The Project ROW crosses the following farm properties: Escobar's Highland Farm, Pocasset Farm, and Van Hoff Farm.

Table 6-3 Farmland Soils of Statewide Importance within the Study Area

Soil Map Unit Symbol	Phase	Percent Slope
Bc	Birchwood sandy loam	0 to 3
BrB	Broadbrook silt loam	3 to 8
NeA	Newport silt loam	0 to 3
NeB	Newport silt loam	3 to 8
NeC	Newport silt loam	8 to 15
PmA	Pittstown silt loam	0 to 3
PmB	Pittstown silt loam	3 to 8
Se	Stissing silt loam	0 to 3

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

6.4.4 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 6-3).

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 6-4.

Table 6-4 Soil Mapping Units with Potential Steep Slopes within the Study Area

Soil Map Unit Symbol	Soil Phase	Percent Slope	Erodibility Hazard	Surface K Values
BrB	Broadbrook silt loam	3 to 8	Phel	0.43
CeC	Canton and Charlton-fine sandy loam, very rocky	3 to 15	Phel	0.17-0.24
NeB	Newport silt loam	3 to 8	Phel	0.24
NeC	Newport silt loam	8 to 15	Hel	0.24
PmB	Pittstown silt loam	3 to 8	Phel	0.24

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.
Hel Highly Erodible
Phel Potentially Highly Erodible

6.5 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 (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 subwatersheds and those that are located within the Study Area are the Upper East Passage, Lower East Passage, and the Sakonnet River subwatersheds (Raposa and Schwartz, 2009). The bodies of water that are located within these watersheds are Saint Mary's Pond, Lawton Valley Reservoir, Sisson Pond, Barker Brook, Bloody Brook, an unnamed tributary to Lawton Valley Reservoir, Sisson Pond Brook, an unnamed tributary to Sisson Pond, Mother of Hope Brook, and Bailey's Brook. 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 6-5.

The Study Area is drained by waterways which generally flow to the west and southwest into Narragansett Bay. Figure 6-4 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.

Lawton Valley Reservoir, Saint Mary's Pond, and Sisson Pond, all of which are owned and operated by the Newport Water Division (City of Newport) as drinking water supplies for Aquidneck Island, are impaired for fish and wildlife habitat due to total phosphorus as well as a non-pollutant impairment from flow regime alterations that stem from their use as drinking water reservoirs (Environmental Protection Agency [EPA], 2014; RIDEM, 2015a). The three drinking water reservoirs are also designated as impaired for their designated use as public drinking water supplies due to elevated levels of total organic carbon (TOC). The cause of impairment for total phosphorous is due to high nutrient levels and the cause of impairment for TOC is organic enrichment and oxygen depletion. All three reservoirs are subject to seasonal water quality variations that lead to low water clarity, and frequent algal and cyanobacteria blooms. The source of the flow alteration impairment is attributed to water diversions and impacts from hydrostructure flow regulation and modification (EPA, 2012). The reservoirs and ponds are interconnected through a complex network of piping and pump stations (RIDEM, 2015b). By late fall of 2014 the Newport Water Division had finished the construction of a new drinking water treatment system which has significantly improved the quality of the drinking water supply for Aquidneck Island. However, the quality of the "raw" water from the reservoirs remains impaired. TMDLs for the total phosphorous and TOC are scheduled to take effect in 2017 and a TMDL is not required for the flow regime impairment.

The Newport Water Division is in charge of conducting quarterly water quality monitoring to ensure compliance with EPA's Safe Drinking Water Act (City of Newport, 2013). With the exception of Bailey's Brook, the other water bodies within the Study Area have not been assessed for any impairments (Table 6-6; EPA, 2014; RIDEM 2015).

Table 6-5 Surface Water Resources within the Study Area

Water Body Name	Town	Use Classification	Approximate Location
Bailey's Brook	Middletown	AA	Flows south from Sisson Pond to Middletown
Barker Brook	Portsmouth	A	Bisects 114 N&S near West Main Road merge
Bloody Brook	Portsmouth	A	Parallel to Long Meadow Road and bisects Hedley Street
Lawton Valley Reservoir	Portsmouth	AA	250 feet southeast of West Main Road
Saint Mary's Pond	Portsmouth	AA	150 feet south of Union Street; east of Sisson Pond
Sisson Pond	Portsmouth	AA	1,000 feet south of Union Street, west of Saint Mary's Pond
Sisson Pond Brook	Portsmouth	AA	Connects Lawton Valley Reservoir and Sisson Pond
Unnamed Trib to Sisson Pond	Portsmouth	AA	Connects southern portion of Saint Mary's Pond to Sisson Pond
Unnamed Trib to Lawton Valley Reservoir	Portsmouth	AA	150 feet perpendicular to Locust Avenue
Mother of Hope Brook	Middletown	B	800 feet west of Jepson Lane, south of Portsmouth border

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.

Source: RIDEM, Water Quality Regulations (December 2010); RIDEM Appendix A. 2014 Index of Waterbodies and Category Listing.

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

Water Body Name	Impairment	Category
Bailey's Brook	Impaired for Fish and Wildlife Habitat, Primary Contact Recreation, Secondary Contact Recreation	5
Barker Brook	Not assessed	3
Bloody Brook	Not assessed	3
Lawton Valley Reservoir	Impaired for Fish and Wildlife Habitat	5
Saint Mary's Pond	Impaired for Fish and Wildlife Habitat	5
Sisson Pond	Impaired for Fish and Wildlife Habitat	5
Sisson Pond Brook	Not assessed	3
Unnamed Trib to Sisson Pond	Not assessed	3
Unnamed Trib to Lawton Valley Reservoir	Not assessed	3
Mother of Hope Brook	Not assessed	3

Category Explanation:

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=

6.5.1 Bailey's Brook

Bailey's Brook is a 4.8 mile state-designated Class AA watercourse that flows southerly from Sisson Pond through Middletown to North Easton Pond, a drinking water reservoir located at the southern end of Middletown, Rhode Island (RIDEM, 2011). As of the 2014 303(d) List of Impaired Waters, Bailey's Brook has been delisted from its former impairment of *Enterococcus*. A TMDL was created for *Enterococcus* in Bailey's Brook and was approved by EPA on September 22, 2011. Bailey's Brook is also impaired for fish and wildlife habitat due to lead and benthic-macroinvertebrate bioassemesnts, both of which have TMDLs scheduled for 2026. 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 or public drinking water supply.

6.5.2 Barker Brook

Barker Brook is a state-designated Class A watercourse which drains into the Upper East Passage of Narragansett Bay from Portsmouth, Rhode Island. It flows southeasterly and ends south of the Dexter Substation and feeds into Bloody Brook which flows southerly parallel to the ROW. As of the 2014 303(d) List of Impaired Waters, Barker Brook has not been assessed and is therefore considered a Category 3 waterbody, meaning insufficient data exists to determine if its designated use is considered impaired or attained.

6.5.3 Bloody Brook

Bloody Brook is a state-designated Class A watercourse located in Portsmouth, Rhode Island. Its headwaters branch from Barker Brook near the Dexter Substation and flow southerly parallel to the ROW before terminating in an agricultural area west of Center View Drive. As of the 2014 303(d) List of Impaired Waters, Bloody Brook has not been assessed and is therefore considered a Category 3 waterbody.

6.5.4 Lawton Valley Reservoir

The 829-acre Lawton Valley Reservoir watershed is located between Route 114 (West Main Road) and Route 138 (East Main Road) in the town of Portsmouth (Joubert et al., 2003). It is situated in the central portion of the Study Area, west of the ROW. The Lawton Valley Reservoir is owned by the Newport Water Division and is part of the Lawton Valley-Portsmouth system along with Sisson Pond and Saint Mary's Pond (Joubert et al., 2003). Together, this water system serves the town of Middletown, the U.S. Navy Base, and the Portsmouth Water and Fire District (Joubert et al., 2003). The District is responsible for providing drinking water and water for fire protection for approximately ninety percent of Portsmouth on Aquidneck Island (Portsmouth Water and Fire District). Land use activity in the watershed is primarily agricultural and medium density residential development (Joubert et al., 2003). The Lawton Valley Reservoir is connected to the East Passage of Narragansett Bay via Lawton Brook.

6.5.5 Saint Mary's Pond

The Saint Mary's Pond watershed is located between Route 114 and Route 138 in Portsmouth and encompasses approximately 515 acres. Water from the pond is diverted via pipeline to Lawton Valley Reservoir and Bailey Brook, which then routes the water to North Easton Pond. Saint Mary's Pond is owned by the Newport Water Division and is part of the Lawton Valley-Portsmouth system along with Sisson Pond and Saint Mary's Pond (Joubert et al., 2003). Together, this water system serves the town of Middletown, the U.S. Navy Base, and the Portsmouth Water and Fire District (Joubert et al., 2003).

6.5.6 Sisson Pond

Sisson Pond watershed is composed of approximately 330 acres and is located adjacent to the Lawton Valley Reservoir watershed and Saint Mary's Pond watershed, and extends into the town of Middletown. Similar to the hydrostructure of Saint Mary's Pond, water is connected via pipeline to Sisson Brook which flows into Lawton Valley Reservoir. Flow is also diverted to Bailey Brook which carries the water to North Easton Pond (Joubert et al., 2003).

6.5.7 Sisson Pond Brook

Sisson Pond Brook is a state-designated Class AA waterway located in Portsmouth, Rhode Island. The Brook serves as a connection between Sisson Pond and Lawton Valley Reservoir. Sisson Pond Brook has been designated a Category 3 waterbody as of the 2014 303(d) List of Impaired Waters.

6.5.8 Unnamed Tributary to Sisson Pond

The Unnamed Tributary to Sisson Pond Brook is a state-designated Class AA waterway located in Portsmouth, Rhode Island. The Brook serves as a connection between Saint Mary's Pond and Sisson Pond. The Unnamed Tributary to Sisson Pond has no official Category Classification because it is not a state-registered water body, however, due to its lack of classification and water quality, for this report's purposes it may be considered a Category 3 waterbody.

6.5.9 Unnamed Tributary to Lawton Valley Reservoir

Unnamed Tributary to Lawton Valley Reservoir is a state-designated Class AA waterway located in Portsmouth, Rhode Island. The tributary flows westerly into Lawton Valley Reservoir and crosses the proposed line between Dexter and Jepson Substations. As of the 2014 303(d) List of Impaired Waters, the unnamed tributary to Lawton Valley Reservoir has been designated as a Category 3 waterbody.

6.5.10 Mother of Hope Brook

The Mother of Hope Brook is a state-designated Class B waterway located just south of the Middletown and Portsmouth town border and flows westerly towards the

Lower East Passage of Narragansett Bay. Mother of Hope Brook has been designated as a Category 3 waterbody as of the 2014 303(d) List of Impaired Waters.

6.5.11 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 Portsmouth[9] and Middletown[10] portions of the Study Area lie within Zone A Special Flood Hazard Areas (SFHA). Zone A denotes that the Base Flood Elevation (i.e. the water-surface elevation of the one percent annual chance flood) has not been determined. A Zone A SFHA is located in a small depression south of Freeborn Street in Portsmouth and approximately 200 feet southwest of the Dexter Substation and the 400 feet west of the ROW. Another Zone A SFHA occurs in association with the drinking water reservoirs in the Study Area: Lawton Valley Reservoir, Sisson Pond, and Saint Mary's Pond in Portsmouth and Middletown. Upgradient of the drinking water reservoirs are areas designated as 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 2014) (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 (Barker Brook, Bloody Brook, Sisson Pond Brook, unnamed tributary to Lawton Valley Farm Reservoir and Mother of Hope Brook) that may require further floodplain investigation.

6.5.12 Surface Water Protection Areas

Three drinking water reservoirs are located within the Study Area: Sisson Pond, Saint Mary's Pond, and Lawton Valley Reservoir. Each of these waterbodies is owned by the Newport Water Division and each of them have varying amounts of protected land surrounding the waterbodies. The Newport Water Division owns a conservation easement around the entire perimeter of Lawton Valley Reservoir, 40 percent of the perimeter of Saint Mary's Pond, and 60 percent of Sisson Pond's perimeter (Joubert et al., 2003). Their use classifications as determined by RIDEM as well as that of their tributaries, are designated AA meaning that they have excellent

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9 Town of Portsmouth, Map No. 445405 0082 J, Panel 82 of 226, revised September 4, 2013 Town of Portsmouth, Map No. 445405 0092 H, Panel 92 of 226, effective April 5, 2010.

10 Town of Middletown, Map No. 445401 0092 H, Panel 92 of 226, effective April 5, 2010.

aesthetic value and are designated as public drinking water supplies or tributaries to supplies and that they are designated for primary and secondary contact recreational activities (RIDEM, 2006). Drinking water supplies are also designated as Special Resource Protection Waters (SRPW; RIDEM, 2006). This designation offers protection under Tier 2 ½ of the Rhode Island Antidegradation provisions as part of Rule 18 of the Rhode Island Water Quality Regulations (GL Ch. 46-12, 42-17.1, 42-35) based on the Federal Antidegradation Policy requirements (40 CFR 131.12) (RIDEM, 2006). The Tier 2 ½ designation requires that there shall be no measurable degradation of the existing water quality necessary to protect the characteristic(s) which cause the waterbody to be designated as an SRPW and adopted under the authority of Chapter 46-12, 42-17.1 and 42-35 of the General Laws of Rhode Island, as amended (RIDEM, 2006). Portsmouth and Middletown have each designated their own watershed protection areas described in the following sections.

Portsmouth Watershed Protection District

The majority of the Project is located within Portsmouth's Watershed Protection District (Figure 6-4; Portsmouth Zoning Ordinance Article III, Section H.3), which was established to protect and preserve the quality of drinking water supplies. The portion of the Project in the Watershed Protection District occurs within each of the two Hydrological Zones:

- "A" Zone: The area within 500 feet from the edge of Lawton Valley Reservoir, Saint Mary's Pond, or Sisson Pond; areas of Stissing silt loam and Mansfield mucky silt loam; and all streams, wetlands and wetland buffers that serve as tributaries to a drinking water reservoir.
- "UD" Zone: The watershed area designated which is contributory to surface water runoff to the primary water bodies either through surface water runoff or groundwater movement that is not in the "A" Zone.

The portion of the Study Area in Portsmouth south of Mill Lane is predominately within either "A" Zone or "UD" Zone. The Study Area north of Mill Lane drains northwest to Narragansett Bay and does not contribute runoff to any "A" Zone waterbodies.

Middletown Watershed Protection District

The Watershed Protection Districts in the Town of Middletown are divided into two zones (Zoning Ordinance of the Town of Middletown, Article 11, Section 1101-1104):

- Zone 1: The area within 200 feet from the centerline of a watercourse or the edge of a surface water body; areas of Stissing silt loam and Mansfield mucky silt loam.
- Zone 2: The watershed area which is contributory to surface water runoff to the primary water bodies contained in Zone 1, and which drains into Zone 1 areas

either though surface water runoff or groundwater movement; it is delineated on the Middletown Official Zoning Map (2014).

A portion of the Study Area that is located within Middletown is also located within a Zone 1 Watershed Protection District. The waterbody that the Zone 1 is centered on is Bailey's Brook, a class AA waterbody that drains to North Easton Pond, another drinking water reservoir owned by the Newport Water District (Joubert et al., 2003). Much of the rest of the Study Area that is located within Middletown is within a mapped Zone 2 Watershed Protection District. This mapping does not appear to be correct since Mother of Hope Brook and its contributing watershed, which make up most of the study area in Middletown including the new Jepson Substation, drain north to Narragansett Bay rather than south or east to any primary Zone 1 water bodies.

6.6 Groundwater

Groundwater resources within the Study Area are depicted in Figures 6-4. 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 (RIDEM, 2009). These groundwater resources 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.

6.6.1 Sole Source Aquifers

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

6.7 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 ER focuses on upland communities. Wetland communities are discussed in Section 6.8 of this ER.

6.7.1 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).

6.7.2 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*). A notable component of the old field west of Jepson Lane is common figwort (*Scrophularia nodosa*). This non-native European species has naturalized to Rhode Island (Gould et al. 1998) and appears very similar to the state-threatened eastern figwort (*S. marilandica*), but eastern figwort was not observed in the Project area.

6.7.3 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 old field are located 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*), and gray birch (*Betula populifolia*).

Abandoned farmland also progresses through a shrub dominated stage before succeeding to forest cover. These areas are located within the Project ROW as well as the larger Study Area and are dominated by a mix of trembling and big tooth aspen (*Populus tremula* and *P. grandidentata*), black cherry, gray birch, and bayberry (*Myrica pensylvanica*) often intermixed with multiflora rose and autumn olive. The understory in these densely stocked stands is weakly developed and often includes poison ivy (*Toxicodendron radicans*), sensitive fern (*Onoclea sensibilis*), and wild geranium (*Geranium maculatum*).

6.7.4 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.

6.7.5 Agricultural Areas

Agricultural land managed in corn and row crops are encountered along ROW. 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.

Pasture and hayfields are also present in the Study Area and are typically managed in European cool season grasses such as timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), sweet vernal grass (*Anthoxanthum ordoratum*), clover (*Trifolium* spp.) and several weed species.

6.8 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.

6.8.1 Study Area Wetlands

State-regulated freshwater wetlands and streams have been identified and delineated within the ROW. Figure 6-5 depicts wetlands field delineated within the Project ROW and those wetland resource areas outside of the ROW have been mapped using the wetlands shapefile[11] 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 fresh water wetlands include swamps, marshes, bogs, forested or shrub wetlands, emergent plant communities and other areas dominated by wetland vegetation with evidence of wetland hydrology. Swamps are defined as wetlands dominated by woody species and are three acres in size, or greater. Marshes are wetlands dominated by emergent species and are one acre or greater in size. Emergent wetlands communities are areas similar to marshes in vegetation composition; however, they are less than one acre in size. Forested and shrub wetlands are also dominated by woody species, similar to swamps, but do not meet the three-acre size criteria.

The upland area within 50 feet of the edge of a swamp, marsh, or bog is regulated as the 50-foot Perimeter Wetland under the RIDEM Freshwater Wetland Rules. Emergent wetland communities, forested wetlands, and shrub wetlands do not merit a 50-foot Perimeter Wetland.

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. If the River or stream is less than 10 feet wide, the area within 100 feet of each bank is regulated as 100-foot Riverbank Wetland. If the River or stream is greater than 10 feet wide, the area within 200 feet of each bank is regulated as 200-foot Riverbank Wetland.

A Pond is an area of open standing or slow moving water present for six or more months during the year and at least one-quarter acre in size. Ponds have a 50-foot Perimeter Wetland associated with the boundary. An ASSF is defined as any body of flowing water as identified by a scoured channel or change in vegetative composition or density that conveys storm runoff into or out of a wetland.

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

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

6.8.1.1 Ponds

There are three large ponds within the Study Area: the Lawton Valley Reservoir, St. Mary's Reservoir, and Sisson Pond. Each of these manmade impoundments are located in Portsmouth and are utilized as public water supply reservoirs.

The Project ROW runs close to the western shore of St. Mary's Pond as it crosses over cropland. This ROW crosses over Sisson Pond to reach the existing Jepson Substation above the western shore of the pond.

6.8.1.2 Swamp

Swamps are defined as areas at least three acres in size, dominated by woody vegetation, where groundwater is at or near the ground surface for a significant part of the growing season. A 50-foot Perimeter Wetland is applied to Swamps regardless of whether they support forest or shrub cover types.

Dominant species in Swamps with shrub cover include sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), and swamp azalea. Other species located in these swamps include arrowwood (*Viburnum dentatum*), Bebb willow, alder (*Alnus* sp.), and silky dogwood (*Cornus amomum*). 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 (*Osmunda cinnamomea*), 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*). Mature forested Swamp is present in wetlands that are located east of Sisson Pond and the 61 and 62 Lines. Winterberry, highbush blueberry, arrowwood, and spicebush (*Lindera benzoin*) are common shrubs associated with these forests. Skunk cabbage, cinnamon fern, false hellebore (*Veratrum viride*), and royal fern (*Osmunda regalis*) are common in the herb stratum.

6.8.1.3 Marsh

Marshes are wetlands at least one acre in size where water is generally above the surface of the substrate and where the vegetation is dominated by emergent herbaceous species. The best example of Marsh in the Study Area is located along the margins of Sisson Pond adjacent to the Project ROW. 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*).

6.8.1.4 Rivers

Rivers located within the Study Area include Bloody Brook, Barker Brook, Mother of Hope Brook, Sisson Pond Brook, and an unnamed tributary to Lawton Valley Reservoir. Further descriptions of these watercourses are provided in Section 6.5 of this ER.

6.8.1.5 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 6.5 of this ER.

6.8.1.6 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 area include rough-stemmed goldenrod, New England aster (*Symphotrichum novae-angliae*), Joe-Pye weed (*Eupatoriadelphus maculatus*), sensitive fern, soft rush, and reed canary grass (*Phalaris arundinacea*).

6.8.1.7 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 are located 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.

6.8.1.8 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.

6.8.1.9 Area 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. An ASSF area crosses the Project ROW between structures 100 and 99 and flows parallel to an alternative access route south of the Project Row (see Figure 2-2, Plans 13-14 of 17). Another ASSF occurs along the perimeter of the Project ROW approximately 100 feet east of the Project ROW and parallel to an alternative access route that is located between Bloody Brook and the ASSF (see Figure 2-2, Plan 15 of 17). Another ASSF stretches between Wetlands 2 and 3 and runs parallel to the access route between Structure Nos. 91 and 92 (see Figure 2-2, Plan 16 of 17).

6.9 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 near the center of Aquidneck Island and is removed from coastal habitats. The existing lines are constructed through woodlands, farmlands and residential housing developments within a cleared ROW. This ROW passes through palustrine wetlands, over perennial and intermittent streams, and within the proximity of three waterbodies, Lawton Valley Reservoir, Saint Mary's Pond and Sisson Pond. 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.

The new Jepson Substation is proposed to be constructed on land that was farmed into the early part of this century, then abandoned. Most of the site consists of tall upland shrub habitat with patches of forested cover types with palustrine shrub and emergent wetland cover types also present. Rank growth of the non-native invasive multiflora rose creates impenetrable thickets.

An overall list of wildlife species expected to occur within the Study Area has been compiled based upon the major habitats present. This list relies on the 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 by 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 6-7 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 by vocalizations.

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Table 6-7 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	Debris Pile	Structure
AMPHIBIANS AND REPTILES																
Spotted Salamander	X					X	X	X	X	X				X		
Northern Redback Salamander	X	X													X	
Four-toed Salamander	X					X	X	X	X			X			X	
Northern Two-Lined Salamander	X											X		X		
American Toad	X	O	X	X		X	X	X	X	X	X			X		
Northern Spring Peeper	X					X	X	O	O	O				X		
Gray Treefrog	O					X	X	X	X	X	X			X		
American Bullfrog								X	X	O	X	X	X	X		
Green Frog						X	X	O	X	O	X	X	O	O		
Northern Leopard Frog[rare]						X	X	X	X					X		
Pickerel Frog	X			X		X	X	X		X	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		
Wood Turtle	X	X	X	X		X	X	X	X	X	X	X	X	X		
Eastern Box Turtle	X	O		X		X	X	X	X			X		X		
Painted Turtle						X	X	X	X	O	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		X
Northern Red-bellied Snake	X	X				X			X						X	X
Northern Brown Snake	X	X		X		X	X	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	X
Northern Ringneck Snake	X					X									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	

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	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	Debris Pile	Structure
Eastern Milk Snake	X	X		X		X									X	X
BIRDS																
Double-crested Cormorant[B]										O	X		X	X		
Least Bittern[B (Rare)]								X	X							
Great Blue Heron[B]	X					X	X	X	X	O	X	X	X	X		
Great Egret[B]										O	X					
Snowy Egret[B]																
Little Blue Heron[B]																
Green Heron[B]	X					X	X	X	X	X	X	X	X	X		
Black-crowned Night Heron[B]								X	X	X						
Yellow-crowned Night Heron[B]								X	X	X						
Glossy Ibis[B]				O			O	X	X							
Turkey Vulture[B]	X	O	X	O												
Canada Goose[B]			X	X	O		X	X		O		X	O	X		
Mute Swan[B]			X	X			X	X	X	O	X	X	X			
Wood Duck[B]	X							X	X	X	X	X	X	X		
American Widgeon[M]								X		X						
American Black Duck[B]							X	X	X	X	X	X	X	X		
Mallard[B]			X	X			X	X	X	O	X	X	X	X		
Canvasback[M]																
Ring-necked Duck[M]								X	X	X	X	X	X	X		
Bufflehead[M]											X	X	X			
Common Goldeneye[M]										X	X	X	X			
Common Merganser[M]	X									X	X	X	X	X		
Osprey[B]										O	X	X	X			O
Bald Eagle[M]											X					
Northern Harrier[M]																
Sharp-shinned Hawk[M]	X												X			
Cooper's Hawk[B (Rare)]	O	O		X												

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	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	Debris Pile	Structure
Northern Goshawk[B] (Rare)	X	X		X												
Red-shouldered Hawk[B]	X								X					X		
Broad-winged Hawk[B]	X			X												
Red-tailed Hawk[B]	O	O	X	O					X							
Rough-legged Hawk[M]		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		
Ring-necked Pheasant[B]		X	X	X												
Ruffed Grouse[B]	X	X														
Wild Turkey[B]	X	X	X	X												
Northern Bobwhite[B] (Rare)	X	X	X	X												
Virginia Rail[B]								X								
Sora[B] (Rare)							X	X	X	X						
Killdeer[B]			X				X							X		O
Willet[B]																
Spotted Sandpiper[B]				X						O	X	X	X	X		
Wilson's (Common) Snipe[M]		X					X	X	X					X		
American Woodcock[B]	X	X	X				X		O					X		
Ring-billed Gull[B]																
Herring Gull[B]										O	X		X			
Common Tern[B]											X					
Rock Pigeon[B]			X	X												X
Mourning Dove[B]	X	O	O	O												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		
Great Horned Owl[B]	X	X	X	X			X	X	x					X		
Long-eared Owl[B]	X	X	X	X			X	X								

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	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	Debris Pile	Structure
Short-eared Owl[M]			X	X			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												
Chimney Swift[B]		X	X	X			X									X
Ruby-throated Hummingbird[B]	O	O				O			O							
Belted Kingfisher[B]										X	X	X	X	X		
Red-bellied Woodpecker[B]	X													X		
Downy Woodpecker[B]	O	O				X								X		
Hairy Woodpecker[B]	X					X								X		
Northern Flicker[B]	O	O	X	O		X									X	X
Eastern Wood-Pewee[B]	O	O				X			O					X		
Acadian Flycatcher[B (Rare)]	X					X								X		
Willow Flycatcher[B]	X	O				X			O							
Least Flycatcher[B]	X					X								X		
Eastern Phoebe[B]	O	O		X		X			O							X
Great Crested Flycatcher[B]	O	O				X										
Eastern Kingbird[B]	O	O		X		X	X	X	O				O	O		
Northern Shrike[M]	X	X		X		X	X	X								
White-eyed Vireo[B]	X	X				X			X					X		
Warbling Vireo[B]	O	O				X								X		
Red-eyed Vireo[B]	O					X								X		
Blue Jay[B]	O	O		O		X								O		
American Crow[B]	O	O	X	X		X										
Fish Crow[B (Rare)]								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
Tree Swallow[B]	X	O	X	O		X	X	O	O	O	X	X	X	X		
Northern Rough-winged Swallow[B]	X	X	X	X			X	X		X		X	O	O		

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	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	Debris Pile	Structure
Bank Swallow[B]	X	X	X	X			X	X		X		X	X	X		
Barn Swallow[B]	X			X			O	O		O		X	X	X		X
Black-capped Chickadee[B]	O	O				X			O					X		
Tufted Titmouse[B]	O	O				X			O					X		
Red-breasted Nuthatch[B (Rare)]	X					X										
White-breasted Nuthatch[B]	O	O				X								X		
Brown Creeper[B]	X					X								X		
Carolina Wren[B]	O	O				O		O	O					X		
House Wren[B]	O	O		O		X			O					X		X
Winter Wren[M]	X					X			X					X		
Marsh Wren[B]								X	X							
Golden-crowned Kinglet[B (Rare)]	X					X										
Ruby-crowned Kinglet[M]	X					X										
Blue-gray Gnatcatcher[B]	O	O				X			O							
Eastern Bluebird[B]	O	O		X		X			O							X
Veery[B]	X					X								X		
Hermit Thrush[B]	X	X				X			X							
Wood Thrush[B]	X					X								X		
American Robin[B]	O	O	X	X		X			O					X		
Gray Catbird[B]	O	O		O		X			O					X		
Northern Mockingbird[B]	O	O							O							
Brown Thrasher[B]	X	X												X		
European Starling[B]	O	O	X	O										X		X
Cedar Waxwing[B]	X	O				X			O		O			X		
Blue-winged Warbler[B]	X	X		X					X							
Nashville Warbler[B (Rare)]	X								X							
Yellow Warbler[B]	X	O				X			O					X		
Chestnut-sided Warbler[B]		X				X			X							
Yellow-rumped Warbler[M]		X				X			X					X		

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	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	Debris Pile	Structure
Black-throated Green Warbler[B]	X					X										
Pine Warbler[B]	X															
Prairie Warbler[B]	X	O														
Black–and-white Warbler[B]	X					X								X		
American Redstart[B]	X					X			O					X		
Worm-eating Warbler[B]	X															
Ovenbird[B]	X					X										
Northern Waterthrush[B]	X					X			X							
Common Yellowthroat[B]	O	O				O	O	O	O	X				X		
Canada Warbler[B]	X					X			X					X		
Scarlet Tanager[B]	O															
Eastern Towhee[B]	O	O				X										
American Tree Sparrow[M]	X	X		X			X	X	X					X		
Chipping Sparrow[B]	X		X	X												
Field Sparrow[B]		O	X	O												
Vesper Sparrow[M]		X	X	X	X		X									
Savannah Sparrow[B]			X	X			X	X								
Grasshopper Sparrow[B (Rare)]			X	X												
Fox Sparrow[M]	X	X														
Song Sparrow[B]	O	O	X	O		X	O	X	O					X		
Swamp Sparrow[B]							X	X	X	X				X		
White-throated Sparrow[B (Rare)]	X	O		X		X								X		
Dark-eyed Junco [B (Rare)]	X			X												
Lapland Longspur[M]			X	X												
Snow Bunting[M]			X	X			X	X								
Northern Cardinal[B]	O	O				X			O					X		
Rose-breasted Grosbeak[B]	O	O				O			O					O		
Indigo Bunting[B]	X	X		X										X		
Bobolink[B]				X			X	X								

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	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	Debris Pile	Structure
Red-winged Blackbird[B]			X	O		X	X	O	O	O				X		
Eastern Meadowlark[B]			X	X						X						
Rusty Blackbird[M]						X								X		
Common Grackle[B]	X		X	X		X	X	O	O		X			X		O
Brown-headed Cowbird[B]	O	O	X	O		O		X						X		
Orchard Oriole[B] (Rare)	X					X								X		
Baltimore Oriole[B]	O	O				O			O					X		
Pine Grosbeak[M]	X		X													
Purple Finch[B]	X	X				X										
House Finch[B]	X															O
Common Redpoll[M]	X	X	X	X				X	X							
Pine Siskin[M]	X	X		X		X			X					X		
American Goldfinch[B]	O	O	X	O		X	O	O	O					X		
Evening Grosbeak[M]	X					X								X		
House Sparrow[P]		O	O	O												O
MAMMALS						X										
Virginia Opossum	X	X	X	X		X	X	X	X					X	X	
Masked Shrew	X	X		X		X	X	X	X					X		
Northern Short-tailed Shrew	X	X		X		X	X	X	X					X		
Eastern Mole	X	X	X	X	X	X										
Star-nosed Mole						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
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		
Eastern Pipistrelle[B]	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
Red Bat[B]	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		

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	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	Debris Pile	Structure
Eastern Cottontail[B]	X	O		X			X	X	O					X	X	
Snowshoe Hare[B]	X	X						X	X					X		
Eastern Chipmunk[B]	O	O		X												
Woodchuck[B]	X	X	X	X											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
Southern Red-backed Vole[B]	X	X	X	X		X			X					X		
Meadow Vole[B]	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		
Southern Bog Lemming[B (Rare)]	X	X		X		X	X	X						X		
Norway Rat[B]		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		
Coyote[B]	X	X		X		X	X	X	X					X	X	
Red Fox[B]	X	X	X	X		X	X	X	X					X	X	
Gray Fox[B]	X	X				X	X	X	X					X	X	
Raccoon[B]	X	X	X	X		X	X	X	X					O	X	
Ermine[B (Rare)]	X	X	X	X		X		X	X					X	X	X
Long-tailed Weasel[B]	X	X	X	X		X	X	X	X					X		X
Mink[B]	X					X	X	X	X	X	X	X	X	X		
Striped Skunk[B]	X	X	X	X		X	X	X	O					X	X	X
River Otter[B]	X							X	X	X	X	X	X	X		
Bobcat	X	X				X	X		X							
White-tailed Deer[B]	O	O	X	X	X	X	X	X	O					X		

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6.10 Fisheries

There are three large freshwater bodies in the Study Area and they are all in Portsmouth. The Lawton Valley Reservoir, Sisson Pond and St. Mary's Reservoir are each artificial impoundments. Each spring RIDEM Division of Fish and Wildlife stocks Saint Mary's Reservoir for recreational fishing with three different species of trout: rainbow (*Oncorhynchus mykiss*), brown (*Salmo trutta*) and brook (*Salvelinus fontinalis*), each species requiring cold water habitat (RIDEM Division of Fish and Wildlife; RIDEM News Release March 28, 2014). The cold water habitat requirements of trout mandate that water bodies, like Saint Mary's Pond, are stocked before temperatures become too high annually to support the fish.

The RIDEM Division of Fish and Wildlife conducted fish surveys in Rhode Island's streams and ponds between 1993 and 2002. According to Alan Libby, a Principal Freshwater Biologist with the Division of Fish and Wildlife (personal communication June 11, 2014), Lawton Valley Reservoir was the only water body surveyed within the Study Area. The primary means of sampling were electrofishing units via boat. A typical warm water fish assemblage was identified in the sampling: largemouth bass (*Micropetrus salmoides*), chain pickerel (*Esox niger*), pumpkinseed (*Lepomis gibbosus*), bluegill (Lepomis macrochirus), brown bullhead (*Ameiurus nebulosus*), white perch (*Morone americana*), yellow perch (*Perca flavescens*), American eel (*Anguilla rostrata*), and golden shiner (*Notemigonus crysoleucas*). Similar assemblages are expected to occur in Sisson Pond and Saint Mary's Pond.

A segment of Bloody Brook, a first order headwater tributary stream to Barker Brook, flows southward in the cleared ROW in Portsmouth. This stream reach has suffered severe scour evidenced by its deep channel incision and undermined banks. Summer flows in the brook are too small to support a permanent fish population. The RIDEM fisheries section has no sampling points along Bloody Brook, but has sampled a downstream tidal segment of Barker Brook. The following species, typical of tidal estuarine habitats, were identified: four spine stickleback (*Apeltes quadracus*), American eel, goldfish (non-native), inland silverside (*Menidia beryllina*), and mummichog (*Fundulus heteroclitus*).

The headwaters of the Mother of Hope Brook are located west of Jepson Lane where an intermittent stream flows northward across TNEC property. This stream segment does not support fish.

All of the waterbodies and streams within the Study Area support fish populations that require warm water habitat (Table 6-8). American eel was found in every waterbody and stream sampled. This species is catadromous meaning they will migrate from freshwater to oceans in order to spawn. The presence of American eel in every surveyed waterbody and stream demonstrates the presence of existing migration routes from Narragansett Bay or the Atlantic Ocean.

Table 6-8 Observed and Anticipated Fish in Study Area (Libby, 2007)

Waterbody	Eel	GOS	LMB	CHP	BBH	WPE	YPE	PMK	FSS	RBT	BKF	GDF	ISS	MCG
Lawton Valley Reservoir	O	O	O	O	O	O	O							
Sisson Pond	A	A	A	A	A	A	A							
St Mary's Reservoir	A	A	A	A	A	A	A			A				
Barker Brook	O								O			O	O	O

A: Anticipated; O: Observed
Eel: American eel, GOS: Golden shiner, LMB: Large-mouth bass, CHP: Chain Pickerel, BBH: Brown Bullhead, WPE: White perch, YPE: Yellow perch, PMK: Pumpkinseed, FSS: Four-spined stickleback, BKF: Banded killifish, GDF: Goldfish (non-native), ISS: Inland silversides, MCG: Mummichog, RBT: Rainbow trout

6.11 Rare and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System was queried on December 3, 2015 to determine if any federally listed or proposed, threatened and endangered species protected under the Federal Endangered Species Act are located within the Study Area. This query resulted in the identification of the red knot (*Calidris canutus rufa*) and the northern long-eared bat (*Myotis septentrionalis*), both federally threatened species. The red knot breeds in the Arctic tundra and relies on stopover habitat along the east coast as it migrates to southern Argentina (Auduobon.org, accessed December 4, 2015). The red knot's stopover habitat includes coastal mudflats, tidal zones, and sandy beaches (Auduobon.org, accessed December 4, 2015). Suitable nesting habitat for this species is not present in the Study Area. The Project Area may host suitable habitat for the northern long-eared bat which roosts singly or in colonies within live and dead trees (USFWS, 2015a).

In April 2015 the USFWS listed the northern long-eared bat as a threatened species under the federal Endangered Species Act (ESA) due to severe population declines that have been caused by white nose syndrome. Since the Project will require a permit from the ACOE, the Project is considered to have a federal nexus and as such those portions of the Project that do not meet exemption criteria are subject to Section 7 consultation with the USFWS under the ESA.

As aforementioned, trees are a critical aspect of the northern long-eared bats' summer roosting habitat and are used by the bats to rear their pups (USFWS, 2015a). According to the interim 4(d) Rule for the Northern Long-eared Bat (USFWS, 2015b), the ROW portion of the 61/62 Line Upgrade is considered to be exempt from ESA prohibitions because the tree removal that will occur along the perimeter of the ROW will apply to only "danger" trees. Danger trees are those which present the risk of falling and causing personal injury or property damage (USFWS, 2015b). Because only those individual trees that present risks to the utility equipment will be removed within the 61/62 Line ROW, the tree removal would be considered hazardous tree removal under the Interim 4(d) Rule and is therefore exempt from the ESA prohibitions. Where possible, these trees will be removed outside of the time-of-year restrictions as set by the USFWS New England Field Office[12].

The new Jepson Substation will be built within a managed ROW and will require shrub and sapling removal within the new substation site. Additionally, as described in Section 4.3.1, the 63 Line will be temporarily re-routed to accommodate the construction of the new Jepson Substation and will require approximately 0.31 acres of mature tree removal. The extent of tree mature tree removal, in addition to any saplings within the new substation site that have a diameter-breast-height greater than three inches, is considered to be minimal tree removal under the Interim 4(d) Rule because it totals less than one acre (USFWS, 2015b). However, because the presence of northern long-eared bat maternity roosts or hibernacula within the Project Area is unknown, the Interim 4(d) Rule states that consultation with the USFWS New England Field Office will be required (USFWS, 2015b). It will likely be necessary to complete the proposed tree clearing outside of the time-of-year restrictions and to implement other BMPs as deemed necessary by the USFWS.

The Rhode Island Natural Heritage Program (RINHP) database hosted on the RIDEM Environmental Resource Mapping website identifies one Natural Heritage Program polygon that is located within the Study Area that covers the eastern half of Saint Mary's Pond and its surrounding eastern perimeter (Figure 6-6). VHB requested information concerning this polygon from Paul Jordan, the Supervising Geographic Information System Specialist from RIDEM, and received his reply on July 7, 2014. Mr. Jordan indicated that the species represented within the polygon is eastern figwort (*Scrophularia marilandica*), an upland perennial forb with reddish-brown flowers (Hilty, 2014). Although this state-threated plant is located within the larger Study Area, it is not located within the Project ROW or the site of the new Jepson Substation. A follow-up review of the RINHP database on December 3, 2015 revealed that there are no new Natural Heritage Program polygons located within the Project Area.

Eastern figwort is similar in appearance to American figwort (*S. lanceolata*) and both occur in similar habitats. The New England Wildflower Society's website indicates that American figwort is found in areas subjected to anthropogenic disturbance such as forest edges, meadows, and fields and it is considered a facultative upland plant, meaning that while it mostly occurs in uplands it may occasionally occur in wetlands (New England Wildflower Society, n.d.). Eastern figwort is also considered a

12 Thomas R. Chapman, Supervisor of the USFWS New England Field Office. Letter concerning the regional time-of-year restrictions for tree clearing activities. July 7, 2015.

facultative upland plant (USDA) and its typical habitat is woodlands and thickets (Lady Bird Johnson Wildflower Center). The flowering period of American figwort occurs between May and July while Eastern figwort has a longer blooming period between June and October (Lady Bird Johnson Wildflower Center, n.d.).

American figwort 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).

Eastern figwort is classified as a State Threatened species (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).

Plants 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 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. Both plants share same global ranking of G5, indicating that they are demonstrably secure throughout their range, though they may be rare in some parts.

While the known element occurrences for these species are outside of the Study Area, potentially suitable habitats in the Study Area were evaluated in July 2014. Suitable habitats were found along upland portions of the ROW and the old fields at the site of the new Jepson Substation, though neither American or eastern figworts were identified. Several populations of common figwort, a species similar in appearance to eastern figwort, were found at the new Jepson Substation site. Common figwort is naturalized from Europe and is not protected as a rare species (Gould et al., 1998).

6.12 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 (O_3) and carbon monoxide (CO).

Rhode Island developed a State Implementation Plan (SIP) in 1982 to comply with the 1977 CAAA requirements for O_3 and CO. While three pollutants, CO, Nitrogen Oxide (NOx), and Volatile Organic Compounds (VOCs), play a role in O_3 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 O_3 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). The plan 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, 2008). Based on the findings in this ER, it not anticipated that the proposed Project will have a significant effect on the air quality of downwind areas.

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7.0 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 located within an existing ROW, and TNEC's rights to the Project ROW are by fee ownership or easement in the Towns of Portsmouth and Middletown, 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, Middletown adopted its Comprehensive Plan Update in October 2014. Portsmouth remains in the process of updating its Plan; therefore the current Portsmouth Plan (2002) was reviewed for this section and supplemented with current information where available.

7.1 Population Trends

The total population within the Host Communities has decreased steadily between 1990 and 2010 as shown in Table 7-1. The Town of Middletown is projected to continue this downward trend through 2040 while the population of Portsmouth is expected to stay relatively stable through 2040 (Table 7-2). The Host Communities can be characterized as being a mix of suburban and rural areas with a 2010 population that accounted for 3.19 percent of the total State population (Table 7-1).

Table 7-1 Population Trends, 1990-2010

Area	1990	2000	2010	Change 1990-2000 Absolute	Change 1990-2000 Percent	Change 2000-2010 Absolute	Change 2000-2010 Percent
State of Rhode Island	1,003,464	1,048,319	1,052,567	44,855	4.47%	4,248	0.40%
Middletown	19,500	17,334	16,150	(2,166)	(11.11%)	(1,184)	(6.83%)
Portsmouth	16,817	17,149	17,389	332	1.97%	240	1.40%
Host Community Total	36,317	34,483	33,539	(1,834)	(5.05%)	(944)	(2.73%)
Percent of State Populations	3.62%	3.20%	3.19%				

Notes:
* Towns of Portsmouth and Middletown
( ) Negative
Source: R.I. Department of Labor and Training, Labor Market Information Census Data 2000-2010.
U.S. Department of Commerce. 1990 Census of Population: Social and Economic Characteristics of Rhode Island

According to the Rhode Island Statewide Planning population projects, the population of Middletown is projected to decrease by 9.70 percent (1,565 people) between 2010 and 2020 and Portsmouth's population is projected to remain stable with a population increase of 0.06 percent (11 people; Rhode Island Division of Planning, 2013). By 2040 Middletown's population is expected to drop by 24.94 percent from 2010 levels (4,029 people) and Portsmouth's population is expected to modestly increase from 2010 levels by 2.32 percent (403 people; Rhode Island Division of Planning, 2013).

Table 7-2 Population Projections, 2010-2040

Area	2010	2020	2030	2040	Change 2010-2020 Absolute	Change 2010-2020 Percent	Change 2030-2040 Absolute	Change 2030-2040 Percent
State of Rhode Island	1,052,567	1,049,177	1,070,677	1,070,104	(3,390)	(0.32%)	(573)	(0.05%)
Middletown	16,150	14,585	13,460	12,121	(1,565)	(9.69%)	(1,339)	(9.95%)
Portsmouth	17,389	17,378	17,773	17,792	(11)	(0.06%)	19	0.11%
Host Community Total	33,593	31,963	31,233	29,913	(1,576)	(4.70%)	(1,320)	(4.23%)
Percent of State Population	3.19%	3.05%	2.92%	2.80%				

Notes:
* Towns of Portsmouth and Middletown
( ) Negative
Source: Rhode Island Division of Planning, Rhode Island Statewide Planning Program. Rhode Island Population Projections 2010-2040.

7.2 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 financial services sector is extremely important to Rhode Island employing over 32,000 individuals. 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 7-3.

Table 7-3 Labor Force and Employment Estimates, 1990-2015

	State	Portsmouth	Middletown
2015 (October)			
Labor Force	553,119	8,842	8,020
Resident Employment	527,394	8,485	7,709
Resident Unemployment	25,725	357	317
Unemployment Rate	4.7	4.0%	3.9%
2010			
Labor Force	566,704	8,991	8,107
Resident Employment	503,216	8,113	7,327
Resident Unemployment	63,488	878	780
Unemployment Rate	11.2%	9.8%	9.6%
2000			
Labor Force	543,561	9,215	8,509
Resident Employment	521,313	8,909	8,198
Resident Unemployment	22,248	306	311
Unemployment Rate	4.1%	3.3%	3.7%
1990			
Labor Force	525,361	8,863	8,335
Resident Employment	492,002	8,390	7,872
Resident Unemployment	33,359	473	463
Unemployment Rate	6.3%	5.3	5.6%
Total Employment Changes 1990-2015	27,758	-21	-315

Source: Rhode Island Department of Labor and Training, Labor Force Statistics, Not Seasonally Adjusted, 1976-October 2015 http://www.dlt.ri.gov/lmi/laus/state/seas.htm
Rhode Island Department of Labor and Training, Middletown Labor Force Statistics, Not Seasonally Adjusted, 1990-October 2015. http://www.dlt.ri.gov/lmi/laus/town/middletown.htm
Rhode Island Department of Labor and Training, Portsmouth Labor Force Statistics, Not Seasonally Adjusted, 1990-October 2015. http://www.dlt.ri.gov/lmi/laus/town/portsmouth.htm

Historically, the leading employment sectors in the Host Communities have been manufacturing and retail trade. Recently, however, there has been a general shift from manufacturing employment to the professional, scientific, management, administrative and waste management sector.

Currently, the educational, health, and social services sector is the largest source of employment in the Host Communities (see Table 7-4). Professional, scientific, management, administration, and waste management sectors ranked second in the Host Communities. These two categories are predicted to continue to make up the largest employers in the future. The 2010 Census labor force and employment statistics was not complete at the time of this writing.

Table 7-4 Employment by Industry, 2010 and 2015

	Portsmouth		Middletown		Host Communities	% of Total
	2010	2015	2010	2015	Total (2015)	
Agricultural, Forestry, Fishing and Hunting	42	32	72	21	53	0.35%
Mining	*	*	*	*	N/A	N/A
Utilities	*	*	*	*	N/A	N/A
Construction	269	279	340	370	649	4.31%
Manufacturing	1,851	1,490	302	410	1,900	12.62%
Wholesale Trade	106	92	151	147	239	1.59%
Retail Trade	494	460	1,540	1,427	1,887	12.54%
Transportation and Warehousing	75	96	104	154	250	1.66%
Information	67	68	284	243	311	2.07%
Finance, Insurance, Real Estate, and Rental and Leasing	177	186	706	659	845	5.61%
Professional and Technical Services	162	148	2,062	2,093	2,241	14.89%
Management of Companies & Enterprises	*	2	279	317	319	2.12%
Administrative Support & Waste Mgmt.	190	150	183	131	281	1.87%
Government	629	700	776	615	1,315	8.74%
Educational Services		286	270	*	N/A	N/A
Other services (except public administration)	183	176	472	458	634	4.21%
Arts, entertainment, & recreation	779	47	210	105	152	1.01%
Accommodation & Food Services	434	389	1,552	1,365	1,754	11.65%
Armed forces	291	N/A	N/A	N/A	N/A	6.70%
Unclassified Establishments	*	*		0	N/A	N/A
Health care & social services	504	852	1,564	1,371	2,223	14.77%
Total	5,574	5,467	10,924	10,148	15,053	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 – First Quarter 2015. http://www.dlt.ri.gov/lmi/es202/town.htm
Rhode Island Department of Labor and Training: Census of Employment & Wages, City and Town Summary – 2010 Annual http://www.dlt.ri.gov/lmi/pdf/town10ann.pdf

The Project is expected to create approximately 380 jobs in Rhode Island over the five-year construction period with approximately 300 of them located in Newport County.

7.2.1 Municipal Tax Revenue

The Project represents a capital investment of approximately $53 million between fiscal years 2016 and 2020 in Newport County. The Project will increase Rhode Island's Gross Domestic Product (GDP) by approximately $29.8 million over the five year construction period, with $23.8 million of that amount specifically contributing to Newport County's GDP. The AIRP is also anticipated to raise state tax revenue by approximately $2 million during the five year construction period. Once in service, the AIRP is expected to generate approximately $532,800 in new municipal tax revenues for the Town of Portsmouth during the first five years of the Project's life (2017-2022); the Town of Middletown is expected to receive approximately $891,900 in new tax revenues over the same time period.

7.3 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.

7.3.1 Study Area Land Use

As depicted in Figure 7-1, 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 recreation, agriculture, forest, commercial, and institutional.

Residential use in the Town of Portsmouth is dominated by single family homes; these tend to be built tightly together in the northern section of Portsmouth, but the central and southern portions where the Study Area is located are less dense (Town of Portsmouth, 2002). Most residential development in the Study Area is medium density with lots sized at one-half to three-quarters of an acre (Town of Portsmouth, 2002). The southern portion of Portsmouth that borders Middletown is primarily zoned as low-medium or low density (lot sizes of three-quarters of an acre or more; Town of Portsmouth, 2002).

Other land uses within the Study Area in Portsmouth include commercial and industrial uses. There are several commercial-zoned parcels located on the eastern portion of the Study Area. These commercial areas have been established to serve community and town-wide shopping and service needs (Town of Portsmouth, 2002). Local commercial space is occupied by businesses such as Bank Newport and Clement's Marketplace. 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 Portsmouth, 2002). The primary industrial area within the Study Area is an industrial park located between High Point Avenue and West Main Road.

Educational and Institutional facilities located within the Study Area include the Melville Elementary School and playground located at 1351 West Main Road adjacent to the Melville Campgrounds. The Elementary School is located on the far western side of the Study Area, approximately 2,000 feet west of the ROW. The Portsmouth Nursery School is located at 2732 East Main Road, approximately 2,000 feet northwest of the Dexter Substation. Additionally, the Portsmouth School Department's Main Administration Building is located on 29 Middle Road near the intersection with Hedley Street, approximately 1,300 feet east of the ROW. The Portsmouth Free Public Library is located at 2658 East Main Road, approximately 1,700 feet west of the Dexter Substation.

Medical and health facilities located within the Study Area include the East Bay Endoscopy Center, which is part of the University Endoscopy Group which provides outpatient gastrointestinal surgeries. This clinic is located approximately 2,000 feet west of the ROW. Another facility is Atria Aquidneck Place, which is a senior care facility located on 125 Quaker Hill Lane and is approximately 200 feet east of the ROW.

The Portsmouth Police and Fire Departments are also located within the Study Area, at 2270 and 2300 East Main Road, respectively. The Portsmouth Canvassing Authority, which is responsible for voter registration and other essential election work, is located at 2200 East Main Road, approximately 300 feet east of the ROW.

The Portsmouth Transfer Station, used to transport recycling and waste to Rhode Island's Central Landfill in Johnston, is located at the intersection of West Main Road and Hedley Street. The Portsmouth Water and Fire District is also located within the Study Area on 1944 East Main Road.

Residential use in the Town of Middletown is largely composed of single family dwellings (57 percent of the housing stock; Town of Middletown, 2014). The central portion of Middletown, where the Study Area is located, is primarily zoned for medium to medium-high density residential, with lots ranging from one-eighth of an acre to one full acre (Town of Middletown, 2014). Other land uses within the Study Area in Middletown include conservation area and agricultural land (Town of Middletown, 2014).

The Study Area also encompasses several parcels of open space and agricultural land, detailed below in Section 7.3.3.

7.3.2 Land Use Along the Transmission Line Corridor

From a north to south oriented view, the ROW begins at the Dexter Substation, which is located off of Freeborn Street and approximately 300 feet west of Route 24 northbound. The ROW travels southerly through a forested area and parallel to Bloody Brook until the brook turns west, south of Hedley Street. The ROW continues through residential neighborhoods, and agricultural fields and forested wetlands. It then proceeds across the Green Valley Golf Course and threads between Saint Mary's Pond and Sisson Pond through a vegetated ROW and then turns sharply west and crosses the southern portion of Sisson Pond and crosses Jepson Lane where it terminates at the new Jepson Substation. The ROW crosses some open space that has been protected through conservation easements or agricultural preservation land. These properties include Escobar's Highland Farm, Green Valley Golf Course and Country Club, Pocasset Farm, Sisson Pond, Newport Water Department Conservation Easement, and Van Hof Farm.

7.3.3 Open Space and Recreation

Much of the southeast and south-central portions of Portsmouth are classified as agricultural land or open space, and as of 2012 approximately 6,484 acres of land on Portsmouth's mainland (excluding the islands) are classified as open space, which amounts to 36 percent of the town's land (Aquidneck Island Planning Commission, 2012). Middletown has approximately 4,732 acres of land that is classified as open space or recreational land, which accounts for approximately 49 percent of Middletown's total area. There are several areas of open space and recreational area present within the Study Area and most of it has been conserved through the cooperation of Aquidneck Land Trust and land owners. Aquidneck Land Trust is a local non-profit dedicated to conserving land on Aquidneck Island. The Study Area encompasses the following open space and recreation lands.

7.3.3.1 Portsmouth

Alvarnas/Lacerda Farm

This 6.48 acre farmland parcel was owned and operated by the Alvarnas family since 1925 and was purchased for potato farming by the Lacerda family in 2003. The farmland is located just north of Sisson Pond and south of Thurston Farm, approximately 600 feet east of the ROW. The property acts as a buffer to northeastern portion of Sisson Pond. Aquidneck Land Trust worked with the owners in 2003 to purchase a conservation easement for the property.

Carnegie Abbey Club

The Carnegie Abbey Club is a private golf and sporting club located on over 500 acres of land to the east of West Main Road and north of Cory's Lane. The eastern limits of the Club's property line is located approximately 2,000 feet west of the ROW.

Elshant Preserve

This 5.45 acre property owned by the Town of Portsmouth abuts the eastern portion of Sisson Pond and is a designated bird sanctuary. The land serves as a buffer to the drinking water reservoir. The property is located approximately 100 feet southeast of the ROW. Aquidneck Land Trust conserved the property with the help of the town in 2006 (Aquidneck Land Trust Interactive Map).

Escobar's Highland Farm

In 2005 Aquidneck Land Trust worked with the owners of Escobar's Farm to purchase a deed to development rights that permanently conserved 75 acres of the property as agricultural preservation land. The conservation holdings of the property are shared by Aquidneck Land Trust, the State of Rhode Island and the Town of Portsmouth. This farm is the last remaining dairy farm on Aquidneck Island and also grows pumpkins, Christmas trees, and animal feed (Aquidneck Land Trust; Escobar Highland Farm). The western-most portion of the farm is crossed by the ROW just north of West Passage Drive and Center View Drive. The entire farm falls within the Study Area.

Green End Farm/ Three S Corporation

The agricultural development rights of this farmland was purchased by the State of Rhode Island in 1988. This 48 acre property is now protected via agricultural land preservation. It is located immediately east of Van Hof Farm and Wicks Nursery and is approximately 1,750 feet east of the ROW.

Green Valley Golf Course and Country Club

This 127 acre parcel located north of Union Street is a semi-private country club owned and managed by Green Valley Country Club. In 2009, Aquidneck Land Trust worked with the property owners to permanently conserve the property. This land acts as a water quality buffer to Lawton Valley Reservoir and Saint Mary's Pond (Aquidneck Land Trust). It also provides public recreational opportunities and scenic vistas. The ROW bisects portions of the Green Valley Country Club from existing Structure Nos. 117 through 122.

Heritage Park

Heritage Park is on the National Register of Historic Places (74002054) and is approximately 1,400 feet west of the ROW. This park is recorded as the highest point on Aquidneck Island and is the location of the main battlefield in the Battle of Rhode Island. The Battle of Rhode Island of 1778 was one of the major Revolutionary War engagements in Rhode Island in which the British were repelled by the 1st Rhode Island Regiment (Rhode Island Historical Preservation Commission, 1979).

Melville Pond Campground

This 153 acre recreational area is owned and managed by the Town of Portsmouth. It is located west of West Main Road and provides camping, hiking and fishing opportunities (Town of Portsmouth, 2002). These campgrounds are located adjacent to the Melville Elementary School, approximately 2,300 west of the ROW.

Oakland Farm & Forest

The Oakland Forest, reported to have one of the oldest stands of American beech trees in the United States, is located east of Saint Mary's Reservoir between Carriage Drive and Oakland Farm Road. It is approximately 2,400 feet east of the ROW. The Aquidneck Land Trust has developed walking trails through the property.

Patriots Park

Patriots Park is located within the Study Area, approximately 700 feet southwest of the Dexter Substation, situated between the north bound lane of West Main Road and the south bound off-ramp of Route 24. This park is part of the same historic district as Heritage Park and is a memorial to the First Black Militia who fought as members of the 1st Rhode Island Regiment in the Battle of Rhode Island. The park is on the National Register of Historic Places (74002054) (Rhode Island Historical Preservation Commission, 1979).

Pierce Anthony Farm

The 16.5 acre Pierce Anthony farm is located on the east side of East Main Road, south of Immokolee Drive. Aquidneck Land Trust helped to establish a conservation easement for the farmland, which buffers the Sakonnet River and offers scenic vistas of the river (Aquidneck Land Trust, 2012). This property is located approximately 1,900 feet east of the ROW.

Pocasset Farm

The 88 acre Pocasset Farm bounds the northern property line of the Green Valley Golf Course and Country Club. The State of Rhode Island purchased the agricultural development rights to this farm in 1990 and it is now protected by an agricultural land preservation easement. A portion of the Project ROW near existing Structure No. 117 crosses the northwestern edge of the farm's property line.

Saint Mary's Pond, Sisson Pond, and Lawton Valley Reservoir

These drinking water reservoirs are all owned and operated by the Newport Water Division. In 2005 Aquidneck Land Trust worked with the Newport Water Division and the Town of Portsmouth to develop a conservation easement that permanently protects the 483 acre property which includes all three reservoirs and the associated buffer areas. These ponds have also been officially designated as "scenic areas" by the RIDEM Division of Planning and Development (1990). The ROW crosses Sisson Pond and parallels the western shore of Saint Mary's Pond.

Thurston Farm

In 2002 Aquidneck Land Trust worked with the farm owners to conserve 16.34 acres of this farm located on the south side of Union Street, just north of Sisson Pond and approximately 1,000 feet west of the ROW. The property is a historic farmstead that provides a buffer to Lawton Valley Brook as well as wildlife habitat and scenic vistas within the Center Island Greenway (Aquidneck Land Trust, 2012).

Van Hof Farm

Van Hoff Farm is bisected by Sisson Pond. One portion is located on east side of Jepson Lane directly adjacent to the northern boundary of the existing Jepson Substation. The other portion is located east of Sisson Pond and south of Saint Mary's Pond. This portion of Van Hoff Farm is crossed by the ROW near existing structures 133X and 134. Both parcels total 75 acres. This farm grows flowers and bedding plants and its development rights are owned by the State of Rhode Island (Town of Portsmouth, 2002).

Wicks Nursery

This 37.6 acre parcel of farmland is located to the south of Van Hoff Nursery, southwest of Green End Farm, and abuts the Middletown border. In 2011 Aquidneck Land Trust worked with the nursery owners and the Town of Portsmouth to purchase a perpetual deed to development rights and conservation easement to conserve the land via agricultural land preservation. This farmland is contiguous with a number of other conserved parcels in the Center Island Greenway (Aquidneck Land Trust). The property is located south of Van Hof Farm and is approximately 1,100 feet southeast of the ROW.

7.3.3.2 Middletown

Bally Machree Farm

This 8.16 acre organic vegetable farm is located on the east side of Jepson Lane, and was conserved through a conservation easement with the help of Aquidneck Land Trust in 2001. It is located within the Sisson Pond watershed and acts as a buffer to protect the drinking water quality (Aquidneck Land Trust). It is located approximately 2,000 feet south of the ROW.

Cousens Farm

Located in Middletown south of Sisson Pond, this 35 acre farm parcel was conserved with the help of Aquidneck Land Trust in 2001. This property acts as a buffer area to the Sisson Pond and Saint's Mary's Pond watersheds. It is located just north of Bally Machree Farm and is approximately 900 feet south of the ROW.

Jordan Open Space

This 25 acre parcel is protected private land on the west side of Jepson Lane in Middletown, across the street from Cousens Farm (Town of Middletown, 2011). It is located approximately 1,400 feet south of the ROW.

Kesson Farm and Open Space

Kesson Farm and Open Space is a three acre parcel of open space located approximately 1,200 feet west of Jepson Lane and abuts the eastern border of Simmons Farm.

Peckham Farm

Located on the west side of Jepson Lane, this 12 acre parcel of farmland was conserved with the help of Aquidneck Land Trust in 2008 through a conservation easement. It is located on the eastern side of Sisson Pond and near the headwaters of Mother of Hope Brook (Aquidneck Land Trust, 2012). It abuts the northern property line of the new Jepson Substation.

Prescott Farm

The eastern-most corner of Prescott Farm falls within the portion of the Study Area that is approximately 1,500 feet west of Jepson Lane and abuts the northern boundary of neighboring Simmons Farm. The farm property is owned by the Newport Restoration Foundation and it contains a historic 1812 windmill and other historic buildings (Newport Restoration Foundation).

Simmons Farm

Located approximately 1,500 feet west of Jepson Lane and north of John Kesson Lane, this agricultural land is privately owned farmland that also houses a petting zoo. The farm is protected by RIDEM which purchased the agricultural development rights to the property in 1993.

7.3.4 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 institutional, residential, industrial, open space, and public water supply.

The most current future land use plan developed by the Town of Portsmouth is from 2002 (Town of Portsmouth, 2002). These plans outline that the Study Area contains medium, low-medium, and low density residential land use, open space, water front districts, and a light industrial area in the current location on High Point Avenue and a new area in the far western portion of the Study Area. These predicted uses are consistent with the present use of the Study Area with the exception of the light industrial area in the western portion of the Study Area, which does not presently exist.

The current land use of the Study Area in Middletown consists of conservation/open space, medium density and medium-high density residential land, agriculture, wetland, and utilities (Town of Middletown, 2014). The Middletown land use plan for 2025 predicts that these uses will change only slightly within the Study Area: the

Area will contain publicly-owned and/or zoned open space, protected agricultural and open space, and some medium-high density residential land will be reduced to medium density use. There is also a small expansion of industrial use in the southeastern portion of the Study Area and one section of medium high density housing that will remain unchanged.

A review of Portsmouth's Comprehensive Plan (2002) contains limited discussion of electrical utilities. There is a provision in the implementation of the economic development strategy (Economic Development Element, Section VI Subsection F) to plan for utilities and services development to improve the reliability of electrical power and meet the requirements of targeted businesses (Town of Portsmouth, 2002).

Middletown's Comprehensive Plan (2014) calls for the development of an economic policy that will "invest in critical infrastructure necessary to develop a robust and diversified economy." The policy calls for an action item concerning the development of a comprehensive assessment of projected infrastructure needs, including electrical, versus the available resources and capabilities.

Based on the Towns' similar interests in improving the reliability of electrical power to businesses and residents, the implementation of the Aquidneck Island Reliability Project will help the towns to achieve their shared objective.

7.4 Visual Resources

The visual quality of a place is determined by the perceived aesthetic value of the available views, as influenced by topography, vegetation, and land use. The existing National Grid ROW extends approximately 4.4 miles on Aquidneck Island, from the Dexter Substation in the Town of Portsmouth, to the Jepson Substation in the Town of Middletown, Rhode Island. The visual study area for this Project was defined as the area within a one-mile radius of the center line of the existing transmission corridor. Aquidneck Island is a relatively narrow landform that rises, from the Sakonnet River on the east and Narragansett Bay on the west, to an elevated central ridge that runs in a north-south direction. 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 285 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 24, 114, and

138. Significant portions of Routes 114 and 138 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 also features clustered business parks with larger buildings occupied by both offices and light industrial facilities.

A few large areas of open agricultural land are scattered throughout the study area (primarily within the central and southern portions). 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 more 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. The study area includes a few larger water bodies, such as the St. Mary's Pond Reservoir and Sisson Pond (both located in in the southern portion of the study area).

A number of resources/sites that could be considered visually sensitive occur within the study area. These resources 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 Mary's Pond/Sisson Pond State Scenic Area, Hessians Hole Swamp State Scenic Area, Sandy Point Road State Scenic Area, Paradise Avenue State Scenic Byway, and Mitchell Lane State Scenic Area. 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 and transportation corridors. Specific viewer groups within the study area include local residents, through-travelers, and visitors.

7.5 Noise

7.5.1 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 7-5 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 7-5 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.

7.5.2 Substation

A noise study was carried out to evaluate sound levels in the residential area that abuts the site of the new Jepson Substation. The noise study included a noise monitoring program to establish existing sound levels, calculations of Project-related sound levels at the nearby sensitive receptor locations, and determination of compliance with the applicable noise impact criteria.

7.5.3 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 new Jepson Substation is located within both Portsmouth and Middletown. Both towns have developed noise impact criteria as follows:

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

Receiving Land Use	Time	Sound Limit
Residential and open space	7 AM to 10 PM	65
	10 PM to 7 AM	55
Commercial and waterfront	At all times	75
Light and heavy industrial	At all times	75
Public water	At all times	75

Source: Table I: Maximum Permissible Sound Levels by Receiving Land Use, Code of the Town of Portsmouth, Rhode Island, Chapter 257-7, July 2014.

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

Receiving Land Use	Time	Sound Limit
Residential and open space	7 AM to 10 PM	65
	10 PM to 7 AM	55
Business (general, office, limited)	At all times	75
Light industrial	At all times	75
Industrial park	At all times	75
Municipal	At all times	75
Public Water	At all times	65
Noise sensitive areas	7 AM to 10 PM	65
	10 PM to 7 AM	55

Source: Maximum Permissible Sound Levels By Receiving Land Use, Town of Middletown, Rhode Island Code of Ordinances, Section 130.80 (A), September 30, 2014.

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.

7.5.4 Existing Sound Levels

The existing sound levels were measured using a Type 1 sound analyzer (Larson Davis 831). Measurements were conducted during a typical weekday for 24 hours on July 9th-10th, 2014 at two locations. The measured sound level data under existing conditions was dominated by noise from mechanical equipment associated with the existing substation, nearby local airfield activities, local roadway activities, and wildlife activities. The sound levels were found to be typical of a suburban area and that they do not exceed either town's daytime or nighttime standards residential noise criteria.

During the noise study, it was noted by the monitors that the existing Jepson Substation equipment produced a "pure tone". Using a conservative assessment, it is expected that this tonal sound will also be produced by the new substation. The pure tone therefore reduces the sound criteria by 5 dB(A) under daytime and nighttime conditions to 60 dB(A) and 50 dB(A) respectively.

7.5.5 Project Sound Levels and Conclusion

The noise analysis calculated the potential sound levels at the new substation assuming full operation of the proposed transformers with a pure tone condition without the screening wall. The sound levels generated by the transformers range from 37 dB(A) to 48 dB(A). These sound levels are below both Portsmouth's and Middletown's sound limit of 50 dB(A) for the residential zoned areas during the nighttime period with a pure tone and are therefore in compliance with their noise ordinances.

7.6 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 be will also be consulting with the Army Corps of Engineers.

7.6.1 New Jepson Substation

PAL completed a cultural resources due diligence review to identify historic properties and archaeological sites for the new Jepson Substation. In accordance with Section 106 of the National Historic Preservation Act, the RIHPHC reviewed the results of the survey and since no cultural material was recovered, and no significant or potentially significant archeological sites were identified, the RIHPHC determined that no further archeological work is warranted. RIHPHC also concluded that the new Jepson Substation will have no effect on any significant archeological resources (those listed on, or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC dated November 10, 2014 in Appendix C. RIHPHC is currently reviewing the proposed New Jepson Substation layout and details for effects to historic properties.

7.6.2 Upgrading and Rebuilding 61 and 62 Lines

PAL completed a cultural resources due diligence review to identify historic properties and archaeological sites for the 61/62 Line Upgrade Project. In accordance with Section 106 of the National Historic Preservation Act, the RIHPHC reviewed the results of the survey and since no cultural material was recovered, and no significant or potentially significant archeological sites were identified, the RIHPHC determined that no further archeological work is warranted. RIHPHC also concluded that the 61/62 Line Upgrade Project will have no effect on any significant archeological resources (those listed on, or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC dated September 16, 2015 in Appendix C.

TNEC will also be consulting with the Army Corps of Engineers regarding potential effects the Project may have on properties potentially eligible, eligible or listed in the National Register.

PAL has also completed a historic architectural resources survey for the 61/62 Line Upgrade Project. On the basis of the results of the survey and effects assessment, PAL concluded that the proposed Project will have no adverse effect on historic architectural properties The RIHPHC reviewed the historic architectural resources survey completed by PAL and requested additional information to complete their review which TNEC provided on December 16, 2015.

7.7 Transportation

The transportation needs of the Study Area are served by a network of state and local town roads. The ROW crosses or abuts 16 town roads which will be utilized to access the ROW and the Dexter and Jepson Substations (Table 7-8).

Table 7-8 Road Names

Road Name	Town
Freeborn Street	Portsmouth
High Point Avenue	Portsmouth
North Street	Portsmouth
Hedley Street	Portsmouth
West Passage Drive	Portsmouth
Center View Drive	Portsmouth
Full Circle	Portsmouth
Prudence View Drive	Portsmouth
Mill Lane	Portsmouth
White House Terrance	Portsmouth
Madison Way	Portsmouth
Greystone Terrace	Portsmouth
Elaine Avenue	Portsmouth
Locust Avenue	Portsmouth
Union Street	Portsmouth
Jepson Lane	Portsmouth and Middletown

7.7.1 Newport State Airport

The Project was evaluated to determine any limitations and/or permitting requirements associated with its location with respect to the Newport State Airport (KUUU) in Middletown, Rhode Island. Lines 61/62, new Structures Nos. 135 through 137, existing Jepson Substation, the proposed new Jepson Substation and select Line 63 structures proposed to be replaced were evaluated in terms of the applicability of "Penetration of Approach Surfaces" described in *Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace*. The Reporting Requirements for FAA Form 7460-1 (Notice of Proposed Construction or Alteration) were also reviewed. Part 77 allows the "FAA to identify potential aeronautical hazards in advance thus preventing or minimizing the adverse impacts to the safe and efficient use of navigable airspace." Due to the proximity of the Project to the Airport, an FAA obstruction evaluation using FAA Form 7460-1 would need to be completed for any structures within two miles of a public use airport, regardless of anticipated Part 77 impacts, and may be required for structures farther away, as well.

The FAA has developed a web-based screening tool called the Notice Criteria Tool, which assists with determining whether there could be Part 77 impacts, and informs the user whether or not they are required to file an obstruction evaluation using FAA Form 7460-1, Notice of Proposed Construction or Alteration. The existing and new Jepson Substations, 63 Line replacement structures and 62 Line structures 137 through 131, were evaluated in the FAA Notice Criteria Tool. In addition, every third Structure north of 131 along the 62 Line (between structures 128 and 92) was evaluated using the Notice Criteria Tool; because of the structures' increasing distance from the Part 77 surfaces.

The Part 77 surfaces considered in the evaluation included:

- Primary: Aligned (longitudinally) with each runway and extends 200 feet from each runway end.
- Horizontal: Horizontal plane 150 feet above the established airport elevation. Constructed by swinging arcs around the end of the Primary Surface.
- Conical: 20:1 slope surface extending beyond the Horizontal Surface.
- Approach: Longitudinally centered with the runway and extends beyond the Primary Surface. The Approach Surface for Runways 16 and 22 (Non Precision Runways) require a minimum 34:1 slope.
- Transitional: Constructed at a 7:1 slope to join Approach and Horizontal or Approach and other Transitional Surfaces.

The Notice Criteria Tool also considers other criteria, in addition to the Part 77 surfaces, such as instrument approach areas and proximity to navigational aids.

The closest Part 77 surface to the Project is the Approach Surface for Runway 22 at KUUU, extending from the airport in a southwest to northeast orientation. The Approach Surface is longitudinally centered on the extended runway centerline and extends outward and upward beyond the Primary Surface. The Approach Surface for Runway 22 (Non-Precision Runway) requires a minimum of a 34:1 slope.

Because Lines 61/62 are parallel lines and very close to each other physically, only one of the lines was used in the analysis. Line 62 was analyzed to determine what impacts, if any, there would be to the Part 77 surfaces at Newport State Airport. No transmission structures would penetrate the Runway 22 Approach Surface because all structures are adjacent to it and at lower maximum elevations than the closest point of the Part 77 Surface. Structures 131 through 135 border the Approach Surface; therefore, additional analysis was completed to understand the maximum structure heights based on Approach Surface minimums. The height of the Approach Surface at the proposed structures ranges from 156 feet at Structure 131, 159 feet at Structure 132 to 127 feet at Structure 134,[13] while the structure heights range from 86 to 91 feet. Structures 131 through 134 are east of Sisson Pond.

Table 7-9 FAA Part 77 Protected Surfaces Analysis

Structure No.	Ground Elevation (ft)	Approach Surface Height Above Ground (ft)	Proposed Structure Height	Penetrates Part 77 Surface
131	177	156	86	No
132	165	159	91	No
133	165	144	91	No
133X	166	139	91	No
134	167	127	86	No

TNEC, as the Project sponsor, will submit a Form 7460-1 for FAA review for each proposed Project structure on the 61, 62 and 63 Lines, as well as the new substation. The FAA would likely need to conduct an aeronautical study to determine if there would be any hazards to air navigation and what mitigation measures might be necessary. However, it is assumed that the new structures supporting the 61 and 62 Lines and the structures for the new Jepson Substation would likely receive a no objection or conditional determination from the FAA because although the structures exceed an instrument approach area or are in proximity to a navigation facility, they do not protrude into the Part 77 surfaces. Finally, if advised by the FAA, TNEC will notify the FAA 48 hours prior to the start of construction of each pole and within five days of completing construction of each transmission structure via FAA Form 7460-2.

7.8 Electric and Magnetic Fields

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.

Power frequency EMFs are present wherever electricity is used. Sources of these fields include utility transmission lines, distribution lines, substations, building

13 The Approach Surface height considers both the ground elevation at each point and the distance to the closest runway end. Ground elevations for these points range between 162 to 177 feet.

wiring in homes, offices, and schools, and the appliances and machinery used in these locations.

Electric fields are present whenever voltage exists on a wire, and are not dependent on the magnitude of the current flow. The magnitude of the electric field is primarily a function of the configuration and operating voltage of the line and decreases with the distance from the source (i.e., the transmission line.) Electric fields are shielded (i.e., the strength is reduced) by conducting surfaces, including trees, fences, walls, buildings, and most types of structures. The strength of an electric field is measured in volts per meter (V/m) or kilovolts per meter (kV/m).

Magnetic fields are present whenever current flows in a conductor and are not dependent on the voltage present on the conductor. The magnetic field strength resulting from a transmission line is a function of both the current flow on the conductor and the configuration of the transmission line. The strength of these fields also decreases with distance from the source. However, unlike electric fields, most common materials have little shielding effect on magnetic fields.

Magnetic fields are measured in units called Gauss. However, for the low levels normally encountered during daily activities, the field strength is expressed in a much smaller unit, the milliGauss, which is one thousandth of a Gauss.

Electric and magnetic fields from the existing transmission lines were calculated at the edges of the ROW for each of two segments of the ROW using projected annual average and annual peak load levels for the year 2018. Table 7-10 shows calculated electric field levels at the edge of the ROW for the two transmission line segments. Tables 7-11 and 7-12 show the magnetic field (Root Mean Square [RMS] Resultant) levels produced by the existing transmission lines on the ROW under average and peak loads, respectively. The magnetic field at peak loading level is not a good predictor of potential exposure because peak loading on the proposed and existing lines would be expected to occur at most during a few hours on a few days of the year.

Table 7-10 Calculated Electric Field Levels (kV/m) at Edges of ROW under existing conditions (2018 pre-construction)+

ROW Segment	ROW Configuration*	West edge of ROW	East Edge of ROW
Section 1	Single-circuit H-frame	0.46	0.46
Section 1 with distribution	Single-circuit H-frame with distribution	0.48	0.33
Section 2	Double-circuit 3-pole wood structures	0.46	0.46
Section 2 with distribution	Double-circuit 3-pole wood structures	0.48	0.34

+ Electric field levels do not vary with load.
*Physical arrangement of lines on ROW.
Source: Vanderweil, Inc. (2014).

Table 7-11 Calculated Magnetic Field Levels (mG) at Edges of ROW (Annual Average Load) under Existing Conditions (2018 pre-construction)

ROW Segment	ROW Configuration*	West edge of ROW	East Edge of ROW
Section 1	Single-circuit H-frame	38.1	39.6
Section 1 with distribution	Single-circuit H-frame with distribution	39.2	30.9
Section 2	Double-circuit 3-pole wood structures	38.7	40.1
Section 2 with distribution	Double-circuit 3-pole wood structures	39.7	31.7

* Physical arrangement of lines on ROW.
Source: Vanderweil, Inc. (2014).

Table 7-12 Calculated Magnetic Field Levels (mG) at Edges of ROW (Annual Peak Load) under Existing Conditions (2018 pre-construction)

ROW Segment	ROW Configuration*	West edge of ROW	East Edge of ROW
Section 1	Single-circuit H-frame	53.1	55.1
Section 1 with distribution	Single-circuit H-frame with distribution	54.0	45.2
Section 2	Double-circuit 3-pole wood structures	53.8	55.8
Section 2 with distribution	Double-circuit 3-pole wood structures	54.7	46.1

* Physical arrangement of lines on ROW.
Source: Vanderweil, Inc. (2014).

A discussion of the current status of the health research relevant to exposure to electric and magnetic fields is included in Appendix B. This report was prepared by Exponent, Inc.

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8.0 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 have been 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 all 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.

8.1 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 with pockets of glaciofluvial deposits and organic deposits associated with wetland areas.

If bedrock is encountered at or below the surface and it is sufficiently stable and unfractured, the pole structures may be anchored directly to the bedrock which will serve as the footing for the 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.

8.2 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. The Project includes limited grading activities, principally associated with the construction of the Jepson Substation. Minor grading may be necessary to improve existing access roads and/or prepare a work site for structure construction. Standard TNEC construction techniques and BMPs such as the installation of hay bales and 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 disposed of 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.

Highly erodible soils are encountered within the Project ROW. However, on all slopes greater than eight percent which are above wetland and 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 currently occupied by active agricultural fields near West Passage Drive and Union Street south to the Jepson Substation area. In addition, the Project crosses three areas of Farmland of Statewide Importance. These areas are mapped as Stissing soils which are a hydric soil unit, generally consistent with the presence of freshwater wetlands. Sixty-one structures will be located in areas mapped as prime farmland soils.

8.3 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 Barker Brook, Bloody Brook, Unnamed Tributary to Lawton Valley Reservoir, Unnamed Tributary to Sisson Pond, Saint Mary's Pond, Sisson Pond and Mother of Hope Brook. Swamp 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 this situation 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.

8.3.1 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 should be minor as a result of the relatively small area to be disturbed, the use of selective clearing 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.

8.3.2 Hydrology

Some minor, temporary impacts to surface drainage can 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 proposed Jepson Substation has been designed to mitigate increases in peak runoff rates and provide for water quality treatment consistent with the Rhode Island Stormwater Design and Installation Standards Manual.

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 clearing 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.

8.3.3 Floodplain

Based on available FEMA mapping, an SFHA is located in a small depression south of Freeborn Street and west of East Main Road in Portsmouth. Another SFHA occurs in association with the drinking water reservoirs in the Study Area: Lawton Valley Reservoir, Sisson Pond, and Saint Mary's Pond in Portsmouth and Middletown. The one percent annual chance flood represents the extent of flooding that would result during a storm event having a one percent chance of occurring per year. It is recognized that by definitions provided in the RIDEM Freshwater Wetland Rules, all rivers, streams and intermittent streams have one percent annual chance flood though they may not be mapped by FEMA.

None of the 95 proposed structures will be located within a SFHA, however, Structure No. 135 will be located on the western side of Sisson Pond proximate to the mapped SFHA Zone A edge.

The Project will not result in a discharge of fill to mapped SFHAs.

8.4 Groundwater

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

8.4.1 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. Within primary groundwater recharge areas, special safeguards will be implemented to assure the protection of groundwater resources. 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.

8.4.2 Substation

Two new 115/13.8 kV 40 MVA power transformers, two new 115/23 kV 55 MVA power transformers, and one new 115/69 kV 100 MVA power transformer are proposed to be installed at the Jepson Substation. The transformers will use MODF for insulation and cooling. Although MODF is not listed as a hazardous material, it is hydrocarbon based and therefore warrants special attention.

In accordance with EPA SPCC requirements (Title 40 CFR Part 112), containment must be provided to prevent spills from reaching navigable waters. The proposed transformers will be supported on concrete foundations with secondary containment systems. Secondary containment systems will be designed in conformance with guidelines developed by TNEC which are in use throughout TNEC's service territory.

The EPA regulations require that substation transformers containing oil based fluids must have secondary containment for the entire contents of the unit plus sufficient freeboard to allow for precipitation. TNEC secondary containment guidelines oversize the containment to 120 percent of a transformer's MODF volume. Other electrical equipment such as the regulators and breakers contain much smaller amounts of MODF. Any potential leak from these will be trapped in the crushed stone surface.

TNEC performs regular inspections and maintenance of its substation equipment. In addition to regular inspections and secondary containment, the transformers at the new Jepson Substation are monitored for low MODF level, loss of internal pressure and electrical faults. In the event of these conditions occurring, an alarm would be transmitted to TNEC's 24 hour a day trouble center to dispatch a crew to address the problem.

The new Jepson Substation will not involve storage of hazardous materials but will require installation of batteries to provide power in the event of an emergency. The acid contained in the batteries is toxic and corrosive, and is classified as a hazardous material. Leaks from substation batteries are an infrequent event. In the unlikely event of a leak, the liquid will be contained behind the berm until cleanup is performed. Hydrogen gas from a leaking battery will be detected by sensors. If a hydrogen gas condition is detected an alarm is transmitted to TNEC's Control Center and fans are automatically activated to purge gas from the substation control building. These engineering controls, coupled with TNEC's regular inspection and maintenance program, make it unlikely that the battery acid would pose a hazard to the public or the environment.

Activities proposed at Dexter Substation include the removal of three transformers, and three oil filled switches. The new equipment to be installed does not present a potential impact to groundwater quality.

8.5 Vegetation

Impacts to vegetation will occur along segments of the 61 and 62 Lines. Vegetation within the ROW work areas will be mown. Incidental side-line tree removal may be required where "danger trees" are present along the ROW. Following construction, disturbed areas in the vicinity of the pole structures 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 operation are obtained prior to the initiation of management procedures.

8.6 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.

8.6.1 Vegetation Management

Vegetation mowing will occur within biological wetland and state-regulated buffer areas to facilitate construction and maintenance of the proposed transmission line. Approximately 1.4 acres of shrub and sapling clearing will be necessary for the construction of the new Jepson Substation including the temporary 63 Line relocation of which approximately 5,717 SF is located within state- and federal-regulated Palustrine Wetland and 6,958 SF is located within state-regulated 50-foot Perimeter Wetland. Appropriate erosion and sediment control measures will minimize impacts to wetlands from adjacent disturbed areas.

8.6.2 Access Roads

Following the delineation of wetland boundaries within the 4.4 mile Project ROW, a site inspection was conducted to determine access to pole structures which would minimize impacts to wetland areas. Access road locations 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 swamp mats will be used where possible.

One new permanent access road will be constructed within Palustrine and 50-foot Perimeter Wetland to provide future access to the 63 Line and the 37K33 distribution line once the new Jepson Substation construction begins.

8.6.3 Structures

Under the current design of the proposed transmission facilities, engineering and safety requirements necessitate the placement of 50 pole structures within state regulated wetland areas, of which 33 pole structures are within federally regulated biological wetland areas, and 17 pole structures are within state-regulated perimeter and riverbank wetland. The only fill needed for structures is the concrete associated with the foundations and any crushed stone backfill required around the foundation caisson. This would range between approximately 0.7 cubic yards (CY) per foot (for a 5-foot diameter foundation) to 2.9 CY per foot (for a 10-foot diameter foundation), of concrete reveal and crushed stone per structure. Approximately 2,160 SF of permanent impact is anticipated in state- and/or federal-regulated wetlands.

8.6.4 New Jepson Substation

The construction of the approximately 3.1 acre new Jepson Substation will require filling and/or grading approximately 102 square feet (SF) of state- and federal-regulated Palustrine Wetland and 10,745 SF of state-regulated 50-foot Perimeter Wetland. These impacts include the construction of a new gravel access road around the north and west side of the substation to provide access to the 63 Line and the 33K37 distribution line.

8.7 Wildlife

During construction, 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 it is anticipated that existing wildlife utilization patterns will resume and population sizes recover 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 and mitigation of potential impacts, and close coordination with the RIDEM. Impacts to rare, threatened or endangered species will be considered as part of the RIDEM Freshwater Wetlands permit process.

8.8 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.

8.8.1 Social Impacts

The Project will enable TNEC to continue to provide reliable electric services to homes, business and industry throughout Aquidneck Island. 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 4.0, the Upgrade Project will be located entirely within the existing 61 and 62 ROW presently serving Aquidneck Island. 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 4.7. TNEC will also appoint an Ombudsman to serve as a contact for abutters during the construction phase of the Project.

8.8.2 Population

Project construction and maintenance will have no impact on the population but will improve existing electrical service reliability to the population growth trends throughout Aquidneck Island. It also will provide the capability to serve residential, commercial and industrial developments planned for the future.

8.8.3 Employment

The construction of the Project will have beneficial effects on the area economy by creating approximately 380 new jobs for the construction period and increasing Rhode Island's GDP by $29.8 million, with $23.8 million of that amount specifically contributing to Newport County's GDP. Project expenditures may also 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.

8.9 Land Use and Recreation

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

8.9.1 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 reconstruction of the Jepson Substation will further develop the site for utility use.

8.9.1.1 Residential

Residential areas are located in proximity to the ROW and substation sites. In many locations, existing vegetation will continue to provide visual screening of the facilities from residences. Because the proposed transmission lines and substation will occupy areas dedicated to use for electrical facilities, the Project will not displace any existing residential uses, nor will it adversely affect any future development proposals.

8.9.1.2 Agriculture

The proposed Project crosses a number of areas which are presently in agricultural use. Impacts to agricultural uses will occur as a result of the proposed Project but will be limited to the footprints of the transmission line structures, and access roads.

8.9.1.3 Educational Institutions

Educational facilities located with the Study Area include Melville Elementary School located at 1351 West Main Road and the Portsmouth Nursery which is located at 2732 East Main Road. Both facilities are located more than 2000 feet from the Project. Accordingly, no impacts to these facilities are expected.

8.9.1.4 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.

8.9.2 Recreation

No existing recreational uses will be displaced by the Project.

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

8.9.3 Consistency with Local Planning

As documented in the Purpose and Need section of this ER, there is a clear need for improving the electrical reliability to the area. The Towns of Portsmouth and Middletown 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 supply of electricity to support the growth and development envisioned by the Comprehensive Plans of the communities in Project area.

8.10 Visual Resources

National Grid engaged EDR to analyze the potential visibility and visual impact of the Project. The Visual Impact Assessment (VIA) procedures used by EDR are based on methodologies developed by the U.S. Department of the Interior, Bureau of Land Management (1980). They are also consistent with guidance provided by the U.S. Department of Agriculture, National Forest Service (1974), the U.S. Department of Transportation, Federal Highway Administration (1981), and the New York State Department of Environmental Conservation (not dated and 2000). Within a one mile radius visual study area, EDR defined landscape similarity zones (LSZ's) based on the USGS National Land Cover Data set and field review. LSZ's are areas of similar landscape/aesthetic character based on patterns of landform, vegetation, water resources, land use, and user activity. This effort resulted in the definition of six final LSZs, including the following: 1) Suburban Residential, 2) Rural Residential/Agricultural, 3) Commercial, 4) Forest, 5) Water/Waterfront, and 6) Transportation. EDR also identified typical viewer groups and visually sensitive resources within the visual study area. Viewer groups include local residents, through-travelers, and visitors. Visually sensitive resources include historic sites, state-designated scenic areas, state conservation areas, designated open space, schools, cemeteries, waterbodies and areas of intensive land use.

The VIA utilized several evaluation techniques, including viewshed analysis, field evaluation, computer-assisted visual simulations, and the evaluation of the Project's visual impact by a registered landscape architect. This comprehensive analysis evaluated the effect of the proposed Project on the aesthetic character/resources of the study area.

Viewshed analysis evaluated the potential visibility of the existing and proposed transmission structures based on the screening effect of topography only. This is a "worst-case" analysis, in that the screening effect of vegetation and built structures is not considered. Topographic viewshed mapping revealed that both the existing and proposed transmission structures are potentially visible from the majority of the visual study area. The taller proposed structures would only increase areas with potential views of the 61 and 62 Transmission Lines by about 6.5% (i.e., over 93% of the area with potential views of the proposed Project already has potential views of the existing structures). The screening effect of forest vegetation was taken into consideration by running a vegetation viewshed analysis. This analysis assigned a 40 foot height to all mapped forest vegetation and determined that the proposed transmission structures would potentially be visible from 59% of the one-mile radius study area. This represents a 7.9% increase in visible area when compared to the vegetation viewshed of the existing 61 and 62 Line structures.

Field review was conducted to verify the accuracy of viewshed mapping, and to more accurately evaluate potential visibility of the proposed transmission facilities from ground-level vantage points. This fieldwork suggests that actual Project visibility is likely to be more limited than suggested by the viewshed analysis. 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. Open views of the existing line were available in some agricultural areas in the central and southern portions of the visual study area, but were screened in more wooded settings. 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. In these developed settings, clear views of the existing 61 and 62 Transmission Line structures are generally only available from streets and yard areas immediately adjacent to the transmission line ROW, including several relatively new subdivisions where houses have been built in close proximity to the existing transmission line.

Fieldwork also confirmed that views from visually sensitive sites toward the Project are highly variable, based primarily on distance to the Project and the relative openness of the view. In almost all cases, views of the lines from sensitive sites located beyond approximately 0.25-mile from the Project will be partially or completely screened. From most of the historic sites within the study area, views of the existing transmission lines are screened by intervening topography, vegetation, and/or buildings. However, three historic farm properties have relatively open views of the existing transmission lines (and therefore, open views of the Project). The existing transmission lines were only visible from one of the five state-designated scenic areas within the study area.

EDR next prepared computer-generated visual simulations for 10 selected viewpoints which were evaluated by a registered landscape architect. This evaluation methodology involves rating the visual quality of representative viewpoints with and without the Project in place. The 10 viewpoints were selected to represent the LSZs, viewer groups and visually sensitive resources within the study area that would have views of the Project. This evaluation indicated that the visibility and visual impact of the Project will be variable, based largely on the distance of the viewer from the Project, the landscape setting, and the degree to which the new structures differ from the existing transmission structures in their visibility and perceived scale and extent. Ratings by a licensed EDR landscape architect indicate that the proposed transmission lines' overall contrast with the visual/aesthetic character of the area will generally be moderate, however strong to appreciable contrast with the existing vegetation and sky was noted for most viewpoints, due to the new structures' greater height, darker color, and more dominant visual presence. This effect was off-set somewhat by the Project's more limited contrast with existing land use and viewer activity, due to the proposed location of the Project on an existing transmission line ROW. Simulations of the new Jepson Substation indicate that visual contrast presented by the station will likely be appreciable to strong from foreground viewer locations, that provide "worst case" Project visibility. More moderate to insignificant visual contrast can be anticipated from more distant and/or well-screened viewpoints. The new substation's conversion of a largely undeveloped site into a major built facility changes the perceived character of the site from rural to industrial. However, the degree of visual contrast presented by the new Jepson Substation is partially off-set by removal of the existing Jepson Substation across the street, and mitigated to a degree by proposed perimeter screen plantings.

As indicated by the results of the analyses summarized above, visual impact of the proposed Project will generally be restricted to sites within 0.25 mile of the Project that have an unobstructed line of sight toward the proposed transmission lines and substation. In most instances, views of the landscape already include the existing 61 and 62 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, and the relocation of the Jepson Substation to a currently undeveloped site, 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 presents strong contrast with the sky, especially when viewed at foreground distances. National Grid will explore the possibility of utilizing alternate materials for the new transmission structures (i.e., galvanized steel and gray insulators) 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). To help soften the visual impact of the new Jepson Substation, an enhanced planting plan has also been developed, utilizing approximately double the number of trees and shrubs included in the plan evaluated by the VIA. In addition, removal of the old Jepson Substation and four other substations on Aquidneck Island represents substantial visual mitigation. Removal of these substations results in improved visual quality, and/or reduced visual clutter, through the elimination of utility infrastructure and the opening of views to surrounding natural features of the landscape. This type of "off-set" mitigation is appropriate, given the limited options for alternate substation siting and screening.

8.11 Noise

8.11.1 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 61 and 62 Lines.

8.11.2 Jepson Substation

The noise analysis was calculated based on the full operation of the proposed transformers. The sound levels generated by the transformers range from 37 dB(A) to 48 dB(A). These sound levels are below both the Portsmouth's and Middletown's sound limit of 50 dB(A) for the residential zoned areas during the night time period with a pure tone, the most stringent sound criteria that could be applied, and are therefore in compliance with their noise ordinances. The proposed screening wall along the southern fence line will further reduce the sound levels. Noise from the proposed transformers is predicted to increase above ambient noise levels at the property line by one to four dB(A) without mitigation provided by a proposed screening wall.

8.11.3 Construction Noise

Temporary noise impacts will 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 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. TNEC will seek relief from the construction work hour restriction within the respective towns.

8.12 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. At all locations 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.

Similarly, Jepson Substation is an unmanned station, and no long-term impacts to existing traffic patterns or volumes are anticipated following completion of the construction.

8.13 Cultural Resources

8.13.1 New Jepson Substation

The RIHPHC determined that no further archeological work is warranted for the new Jepson Substation. RIHPHC also concluded that the new Jepson Substation will have no effect on any significant archeological resources (those listed on, or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC dated November 10, 2014 in Appendix C. RIHPHC is currently reviewing the proposed New Jepson Substation layout and details for effects to historic properties.

8.13.2 Upgrading and Rebuilding 61 and 62 Lines

The RIHPHC determined that no further archeological work is warranted for the 61/62 Line Upgrade Project. RIHPHC also concluded that the 61/62 Line Upgrade Project will have no effect on any significant archeological resources (those listed on, or eligible for listing on the National Register of Historical Places). Please see correspondence from RIHPHC dated September 16, 2015 in Appendix C.

PAL completed an historic architectural resources survey for the 61/62 Line Upgrade Project. On the basis of the results of the survey and effects assessment, PAL concluded that the proposed Project will have no adverse effect on historic architectural properties. The RIHPHC reviewed the historic architectural resources survey completed by PAL and requested additional information to complete their review which TNEC provided on December 16, 2015.

8.14 Air Quality

8.14.1 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.

8.14.2 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 Portsmouth and Middletown, Rhode Island. Therefore, the mobile source emissions will not be changed due to the proposed Project.

8.15 Safety and Public Health

TNEC substations are locked and enclosed with chain link fence topped with barbed wire to prevent unauthorized entry. Following construction of the facilities, all transmission line structures and substation facilities will be clearly marked with warning signs to alert the public to potential hazards if climbed or entered. Transformers, which are internally insulated and cooled using MODF, are provided with secondary containment systems to prevent the spread of the MODF in the unlikely event of a leak. Transformers are continuously monitored and alarmed to notify National Grid's Control Center of abnormal operating conditions. The Control Center is manned 24 hours a day, seven days a week.

The new Jepson Substation will use SF6 gas as an insulator in the 115 kV circuit breakers. SF6 is commonly used in lieu of insulating oil. When gas insulated equipment is used outdoors, as proposed at the new Jepson Substation, any release concentration would be insignificant when exposed to the atmosphere. Although SF6 is defined as hazardous by USDOT, there is no risk of general public exposure because the switches are located inside the fenced substation yard. The breakers are installed and maintained by trained technical staff and they are checked for integrity during inspections by National Grid personnel.

Following construction of the facilities, all transmission line structures and substation facilities will be clearly marked with warning signs to alert the public to potential hazards if climbed or entered.

Because the proposed facilities will be designed, built and maintained in accordance with the standards and codes as described in Section 4.4, 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 B. This report was prepared by Exponent Health Sciences.

8.16 Electric and Magnetic Fields

The electric and magnetic fields produced by the existing transmission lines at the edges of the ROW in 2018 are compared here to the expected field levels after completion of the Project and five years later[14]. The Project will result in substantial reduction in edge of ROW electric and magnetic fields.

8.16.1 Electric Fields

Electric field levels, which are a function of voltage and line configuration, were calculated and are shown in Table 8-1 for the various configurations of the ROW both prior to and after construction. The Project will reduce the electric fields at the edges of the ROW from the existing field levels. The changes are not uniform because of variations in the configuration and spacing along the ROW. The post construction electric fields will not change between 2018 and 2023 because the voltage of the lines will not change.

14 At the time EMF modeling was done, the expected in-service date was 2018, it is now 2019.

Table 8-1 Calculated Electric Field Levels (kV/m) Pre-Construction and Post-Construction at Edges of ROW+

ROW Segment	ROW Configuration**	Timeframe	West Edge of ROW	East Edge of ROW
SECTION 1				
Without Distribution Lines	Single-circuit H-frame	pre-construction (2018)	0.46	0.46
	Two monopoles	post-construction (2018)	0.11	0.11
	Two monopoles	post-construction (2023)	0.11	0.11
With Distribution Line	Single-circuit H-frame w/ distribution circuit	pre-construction (2018)	0.48	0.33
	Two monopoles	post-construction (2018)	0.06	0.15
	Two monopoles	post-construction (2023)	0.06	0.15
SECTION 2				
Without Distribution Lines	Double-circuit 3-pole wood structures	pre-construction (2018)	0.46	0.46
	Two monopoles	post-construction (2018)	0.11	0.11
	Two monopoles	post-construction (2023)	0.11	0.11
With Distribution Line	Double-circuit 3-pole wood structures w/ dist circuit	pre-construction (2018)	0.48	0.34
	Two monopoles	post-construction (2018)	0.06	0.15
	Two monopoles	post-construction (2023)	0.06	0.15

+ Electric field levels do not vary with load.
**Physical arrangement of lines on ROW.
Source: Vanderweil 2014.

8.16.2 Magnetic Fields

For projects involving construction of new or reconfigured transmission lines, it is National Grid's standard practice to evaluate low cost/no cost options for reducing edge of ROW magnetic field levels through optimization of phase configurations (Ref. Transmission Line Engineering Document GL.06.01.101).

Consistent with this practice, TNEC has optimized the phasing of the lines to minimize edge of ROW magnetic fields.

The magnetic field (RMS Resultant) levels were calculated for the various configurations of the ROW for annual average and peak loads, before (pre-construction 2018) and immediately after construction (2018) and five years after construction (2023). The results are summarized in Tables 8-2 and 8-3.

Table 8-2 Calculated Magnetic Fields (mG) Pre-Construction and Post-Construction at Edges of ROW (Annual Average load)

ROW Segment	ROW Configuration**	Timeframe	West Edge of ROW	East Edge of ROW
SECTION 1				
Without Distribution Lines	Single-circuit H-frame	pre-construction (2018)	38.1	39.6
	Two monopoles	post-construction (2018)	6.6	10.2
	Two monopoles	post-construction (2023)	6.8	10.4
With Distribution Lines	Single-circuit H-frame w/ distribution circuit	pre-construction (2018)	39.2	30.9
	Two monopoles	post-construction (2018)	6.6	24.8
	Two monopoles	post-construction (2023)	6.7	25.0
SECTION 2				
Without Distribution Lines	Double-circuit 3-pole wood structures	pre-construction (2018)	38.7	40.1
	Two monopoles	post-construction (2018)	6.6	10.2
	Two monopoles	post-construction (2023)	6.8	10.4
With Distribution Lines	Double-circuit 3-pole wood structures w/ dist circuit	pre-construction (2018)	39.7	31.7
	Two monopoles	post-construction (2018)	6.6	24.8
	Two monopoles	post-construction (2023)	6.7	25.0

* Physical arrangement of lines on ROW.
Source: Vanderweil 2014.

Table 8-3 Calculated Magnetic Fields (mG) Pre-Construction and Post-Construction at Edges of ROW (Annual Peak Load)

ROW Segment	ROW Configuration**	Timeframe	West Edge of ROW	East Edge of ROW
SECTION 1				
Without Distribution Lines	Single-circuit H-frame	pre-construction (2018)	53.1	55.1
	Two monopoles	post-construction (2018)	9.9	14.7
	Two monopoles	post-construction (2023)	10.8	16.4
With Distribution Line	Single-circuit H-frame w/ distribution circuit	pre-construction (2018)	54.0	45.2
	Two monopoles	post-construction (2018)	9.9	28.4
	Two monopoles	post-construction (2023)	10.8	29.8
SECTION 2				
Without Distribution Lines	Double-circuit 3-pole wood structures	pre-construction (2018)	53.8	55.8
	Two monopoles	post-construction (2018)	9.9	14.7
	Two monopoles	post-construction (2023)	10.8	16.4
With Distribution Line	Double-circuit 3-pole wood structures w/ dist circuit	pre-construction (2018)	54.7	46.1
	Two monopoles	post-construction (2018)	9.9	28.4
	Two monopoles	post-construction (2023)	10.8	29.8

* Physical arrangement of lines on ROW.
Source: Vanderweil 2014.

TNEC has modeled the electric and magnetic fields associated with the existing 61 and 62 Lines, with the rebuilt 61 and 62 Lines, and with the new Jepson Substation. Rebuilding the 61 and 62 Lines will significantly reduce both electric and magnetic fields along both edges of the ROW. In particular, modeled magnetic fields on the west edge of the ROW under 2018 average loads range from 38.1 mG to 39.7 mG under the current line configuration. Following the rebuild, these modeled magnetic fields decline to 6.6 mG. On the east edge of the ROW, magnetic fields under 2018 average loads range from 31.7 mG to 40.1 mG, and decline to 10.2 to 24.8 mG following the rebuild.

As described above, National Grid has optimized the phasing of the lines to maximize the cancellation of the magnetic fields from the phase conductors on the ROW.

Calculated magnetic field levels at the property line of the proposed Jepson Substation site are generally 2 mG or less except where the transmission and distribution lines enter and leave the property.

The electric and magnetic field levels produced by the existing and proposed facilities are well below guidelines for public exposure recommended by the International Committee on Electromagnetic Safety and the International Committee on Nonionizing Radiation Protection. No national scientific or public health agency has determined that exposure to field levels below these guideline levels pose any health hazard. A discussion of the current state of the health research relevant to exposure to electric and magnetic fields is included in Appendix B. This report was prepared by Exponent, Inc.

9.0 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.

9.1 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 are minimized by locating the proposed electric transmission line in the existing ROW. The design and construction of the proposed electric transmission line incorporates measures which minimize impacts to wetlands and other natural features within the ROW. Of the 95 proposed transmission line structures, 45 have been located 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 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.

9.1.1 Mitigation of Natural Resource Impacts

9.1.1.1 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 pole structures for the Project have been limited to approximately 2,100 SF of permanent biological wetland disturbance due to filling for new transmission line structures. Mitigation for these alterations of wetland must be provided in order to comply with federal wetland regulations.

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.

9.1.1.2 Jepson Substation

The new Jepson Substation was sited to avoid significant impact to wetlands, maintain required safety clearances between substation equipment and transmission lines, and maintain reasonable vegetated buffers between the substation and residential abutters on the north and the south.

9.1.1.3 Access Roads

As a further mitigating measure, proposed access routes have been situated to cross streams and wetlands at the narrowest practical point to minimize disturbance. Each of the proposed access ways through wetlands was thoroughly scrutinized for consistency with the RIDEM Freshwater Wetland Rules and will not be a random, unnecessary, or undesirable alteration of a freshwater wetland. Each location was selected to traverse the wetland fringe or a previously disturbed area within the wetland. One new permanent access road will be constructed within 50-foot

Perimeter Wetland to provide future access to the realigned 63 Line and an existing distribution line.

9.1.2 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 61/62 Line Upgrade Project within the existing ROW. Vegetation clearing will be limited so that a visual buffer between residences and the Project is maintained where possible.

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

9.2 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.

9.2.1 Mitigation of Natural Resource Impacts

Given the engineering constraints for the proposed transmission line, in the design of the facility it was necessary to site 33 structures within biological wetlands and 17 structures within state-regulated wetland buffers.

With construction of the existing transmission lines in the 1950s, access roads were established within portions of the ROW. During construction of the Project, vehicles will utilize these existing access roads where practical to minimize disturbance within the ROW.

Access to the structures through wetland areas will be provided by utilizing timber swamp 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. Excavated soils will be stockpiled and spread in approved upland locations well outside all biological wetland areas in such a manner that general drainage patterns will not be affected. Clearing adjacent to wetland areas is of particular concern due to the potential for erosion, and therefore, specific mitigation measures will be implemented to minimize this potential. These measures will include the installation of hay bale diversion berms 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, silt fence or hay bales will be installed across disturbed slopes adjacent to wetland areas in accordance with an erosion and sediment control plan.

Stream crossings will be located 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 is used where the substrate is sufficiently firm or level to support equipment without creating a disturbance to the soil substrate.

9.2.1.1 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 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 there is adequate vegetation in upland areas to function as a filter medium, the water generally will be discharged to the vegetated land surface. Where vegetation is absent or where slope prohibits, water will be pumped into a hay bale or silt fence settling basin 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.

9.2.1.2 Supervision 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 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, National Grid company policies and other commitments. The environmental monitor will be a trained environmental scientist responsible for supervising construction activities relative to environmental issues. The environmental monitor will be experienced in the erosion control techniques described in this ER and will have an understanding of wetland resources that require protection.

During periods of prolonged precipitation, the monitor will inspect all locations to confirm that the environmental controls 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 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 issues and obligations prior to the start of construction. Regular construction progress meetings will provide the opportunity to reinforce the contractor's awareness of these issues.

9.2.2 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.

Some short term impacts are unavoidable, even though they have been minimized. By carrying out the construction of the line in a timely fashion, TNEC will keep these impacts to a minimum. The construction of the new lines in the existing ROW may cause some temporary 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 by email to abutters during construction. TNEC's Ombudsman will be a point of contact for abutters.

9.3 Post-Construction Phase

Following the completion of construction, TNEC uses standard mitigation measures on all transmission line construction projects to minimize the impacts of projects on the natural and social environment. These measures include revegetation and stabilization of disturbed soils, ROW vegetation management practices and vegetation screening maintenance at road crossings and in sensitive areas. Other measures are used on a site specific basis. TNEC will implement the following standard and site specific mitigation measures for the proposed Project.

9.3.1 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 to their former condition, where appropriate. Permanent slope breakers and erosion control devices will be installed in areas where the disturbed soil has the potential to impact wetland resource areas.

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.

9.3.2 Mitigation of Social Resource Impacts

Following construction of the facilities, all transmission line structures and substation facilities will be clearly marked with warning signs to alert the public to potential hazards if climbed or entered.

TNEC will install a screening wall along the southern fence line of the new Jepson Substation to mitigate potential visual and noise impacts. Additionally, the new Jepson Substation will be provided with landscape screening to the south and along portions of Jepson Lane. The existing stone wall along the road will be maintained except in the area of the two driveway curb cuts. On the southern side of the substation, a segment of the existing overhead distribution lines adjacent to the abutting homes will be removed. Where this overhead distribution line is removed, an earthen berm ranging in height from four to eight feet high will be constructed to provide more effective landscape plantings for these southern abutters. North of the substation there is existing tree and shrub vegetation. Some of this natural screening will be removed to allow for the temporary 63 Line relocation around the station that is necessary to provide safe overhead clearances during construction. The cleared area will not be grubbed so TNEC can re-vegetate this area after construction. An undisturbed vegetative buffer ranging in width between approximately 30 to 80 feet will be retained in its natural state along the northern property line. After removal of the temporary 63 Line, the cleared area will be planted with native tree saplings in irregular patterns and clustered groups.

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10.0 Permit Requirements

10.1 Permits and Other Regulations

TNEC must obtain permits under the following state, local and federal statutes and regulations prior to the construction of the Project.

10.1.1 State Permits

10.1.1.1 EFSB License

The Project will require a license to construct a major energy facility from the EFSB pursuant to Rhode Island General Laws (R.I.G.L.) Section 42-98-1 et seq.

10.1.1.2 RIDEM Freshwater Wetlands Permit

The Project will require a freshwater wetlands permit from RIDEM pursuant to R.I.G.L. Section 2-1-18 et seq. for alteration of freshwater wetlands in connection with the construction of certain structures and access roads.

10.1.1.3 RIPDES Storm Water Discharge Associated with Construction Activities

The Project will require a permit from RIDEM for approval of storm water discharge associated with construction activities pursuant to Rule 31 of the Rhode Island Pollutant Discharge Elimination System (RIPDES) Regulations. It is expected that the Project will qualify for authorization under the General Permit and will be automatically authorized as part of the freshwater wetlands permit.

10.1.1.4 Water Quality Certification

The Project will need a Water Quality Certification from RIDEM under Section 401 of the Clean Water Act. It is expected that the water quality certification will be issued as part of the freshwater wetlands permit.

10.1.2 Local Permits

The Project will require the following relief under local ordinances:

10.1.2.1 Portsmouth

Height and Use Restrictions

A dimensional variance from height restrictions is required for transmission and substation structures in excess of 35 feet tall. Zoning Ordinance of the Town of Middletown, Article 3, Section 305. A special use permit is required for the new substation on Jepson Lane and the extension of the 61 and 62 Lines to the new Jepson Substation. Zoning Ordinance of the Town of Middletown, Article 6, Section 602.

Development Plan Review

Development Plan Review is required for the new substation which is considered by the town to be a new commercial development. Zoning Ordinance of the Town of Middletown, Article 3, Section 303.

Special Flood Hazard Areas

Pursuant to Portsmouth Zoning Ordinances Article III, Section F.8, the Zoning Inspector may impose restrictions or other flood protective measures on Public Utilities that are located within SFHAs. SFHAs are defined as Zone A, AE, V, or VE on the Newport County Flood Insurance Rate Map (FIRM) and Digital FIRM issued by FEMA for the administration of the National Flood Insurance Program. A portion of the ROW crosses a SFHA within the vicinity of Sisson Pond. There are only wires crossing above the SFHA so no relief is necessary.

Stone Walls

The Stone Wall Preservation Ordinance in Chapter 333-4-B of the Code of the Town of Portsmouth requires prior approval from the Planning Board for planned alteration or demolition of stone walls. The ordinance requires the stone walls to be restored or relocated in a manner consistent with the original construction. A variance from the Zoning Board of Review will be required for any deviations from the Stone Wall preservation standards.

Watershed Protection District

Much of the Project occurs within Portsmouth's Watershed Protection District (Portsmouth Zoning Ordinance Article III, Section H.3), which was established to protect and preserve the quality of drinking water supplies. The portion of the Project in the Watershed Protection District occurs within each of the two Hydrological Zones:

- "A" Zone: The area within 500 feet from the edge of Lawton Valley Reservoir, Saint Mary's Pond, or Sisson Pond; areas of Stissing silt loam and Mansfield mucky silt loam; and all streams, wetlands and wetland buffers that serve as tributaries to a drinking water reservoir.
- "UD" Zone: The watershed area designated which is contributory to surface water runoff to the primary water bodies either through surface water runoff or groundwater movement that is not in the "A" Zone.

TNEC is required to submit a Project Plan to the Planning Board for formal review, pursuant to Portsmouth Zoning Ordinance Article III, Section H.12. This review also requires an Environmental Review Assessment (ERA) which will evaluate the impacts of the Project on the watershed with regard to pollutant loading and stormwater runoff. The ERA will also include a description of the physical environmental setting within 500 feet of the proposed Project area. Lastly, the ERA requires that TNEC consult with the Newport Water Division regarding the environmental impacts of the proposed Project on the watershed.

Construction Work Hours

Section 257-5(J) of the Code of the Town of Portsmouth exempts sound from permitted construction and demolition activities between the hours of 7AM and 9PM. A variance from the Portsmouth Town Council will be required for any work performed outside of permitted hours.

Erosion and Sediment Control

A Determination of Applicability must be filed with the Building Official for any Project that disturbs one acre or more of existing vegetation, grades, and contours of land to determine if an erosion and sediment control plan must be filed, Town of Portsmouth Ordinance #2010-09-20 Article III, Section I.A. Upon a positive determination, TNEC will submit a soil erosion and sediment control plan for approval by the Building Official. The Building Official would approve, approve with conditions or disapprove such erosion and sediment control plan.

10.1.2.2 Middletown

Height and Use Restrictions

A dimensional variance from height restrictions will be required for transmission and substation structures in excess of 35 feet tall. Zoning Ordinance of the Town of Middletown, Article 3, Section 305. A special use permit from the Zoning Board of Review is required for the new substation on Jepson Lane. Zoning Ordinance of the Town of Middletown, Article 6, Section 602.

Fence and Screening Wall

A dimensional variance will be required for the new substation's proposed fence and screening wall that will exceed the six (6) foot limitation in a residential neighborhood. Zoning Ordinance of the Town of Middletown, Article 7, Section 705(F)(1). A variance will also be required for the use of barbed wire fencing in a residential neighborhood. Zoning Ordinance of the Town of Middletown, Article 7, Section 705(G).

Stone Walls

The Stone Wall Ordinance, Chapter 97 of the Town of Middletown Code of Ordinances, requires Planning Board approval for any alteration or demolition of a stone wall as part of a construction project. A variance from the Zoning Board of Review will be required for any deviation from the general provisions for the protection of stone walls, as listed under Section 97.03 of the Town of Middletown Code of Ordinance.

Watershed Protection District

The Watershed Protection Districts in the Town of Middletown are divided into two zones (Zoning Ordinance of the Town of Middletown, Article 11, Section 1101-1104):

- Zone 1: The area within 200 feet from the centerline of a watercourse or the edge of a surface water body; areas of Stissing silt loam and Mansfield mucky silt loam.
- Zone 2: The watershed area which is contributory to surface water runoff to the primary water bodies contained in Zone 1, and which drains into Zone 1 areas either though surface water runoff or groundwater movement; it is delineated on the Middletown Official Zoning Map (2011).

Stissing and Mansfield soil units are mapped in the vicinity of the Jepson Substation and the relocated 63 Line. The Zoning Map identifies the proposed site of the new Jepson Substation within the watershed boundary draining to the public water supply. As such, the Project is located within both Watershed Zones 1 and 2 and will require a Special Use Permit granted by the Zoning Board.

Construction Work Hours

Section 130.78(H) of the Middletown Town Code exempts "sound relative to permitted construction and demolition activities" from the Noise Abatement Chapter provided such noise occurs between 7 AM and 9 PM. A sound variance from the Middletown Town Council is required for any work performed outside of permitted hours.

Erosion and Sediment Control

Any development project that may cause a disturbance of greater than 50 CY to the terrain (and its contours) and topsoil or vegetative ground cover upon any property within the Town of Middletown mandates the submission of a determination of applicability to the Building Official, pursuant to Chapter 151.02, Construction Site Runoff Control (formerly Soil Erosion and Sedimentation Control). Upon a positive determination, TNEC will submit a SESC Plan for approval to the Building Official. The Building Official would approve, approve with conditions or disapprove such erosion and sediment control plan.

10.1.3 Federal Permits

10.1.3.1 Army Corps of Engineers

The Project will require an ACOE Section 404 Permit for the filling of wetlands in connection with the construction of the structures in wetlands, clearing in wetlands, and the construction of certain temporary access roads.

10.1.3.2 Historic Preservation

Consultation with the RIHPHC (State Historic Preservation Office) and the Tribal Historic Preservation Office is ongoing and will be completed as required by Section 106 of the National Historic Preservation Act.

10.1.3.3 Federal Aviation Administration

The southern end of the Project site near the Jepson Substation is located within 0.7 miles of Runway 22 at Newport Airport, which has a non-precision instrument approach. As such, the Project is located within protected airspace and operational control areas used for air navigation. Protected surfaces extend over the Project site placing the Project within the jurisdiction of the FAA and triggering the need for an FAA Obstruction Evaluation and Airport Airspace Analysis. TNEC will provide a Notice of Construction for each structure to the FAA along with information to enable the FAA to review the Project.

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Appendix A:
Newport Area (Aquidneck Island) Transmission Solution Study Report. April 2015

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Appendix B: Current Status of Research on Extremely Low Frequency Electric and Magnetic Fields and Health: Rhode Island Transmission Projects – The Narragansett Electric Company d/b/a/ National Grid. March 9, 2015

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Appendix C:
Agency Correspondence

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Appendix D:
Visual Impact Assessment Aquidneck Island Reliability Project (Bound Separately)

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