5 PROJECT IMPACT ANALYSIS

5.1 Introduction

This section provides a detailed analysis of the Project's impacts on the natural and social environment. To assess these potential environmental impacts and mitigation, NEP evaluated a series of natural and social environmental criteria including land use, protected land and open space, historical/archaeological sites, tree removal, wetlands and water crossings, rare species habitat, public water supplies, visual, noise, traffic, and electric and magnetic fields ("EMF").

The potential impacts of the Project are both construction-related (temporary) impacts and siting and operation-related (permanent) impacts. Examples of potential temporary construction-related impacts include the temporary placement of construction matting in wetlands for access and the establishment of work areas in wetlands, ground disturbance associated with structure installation and removal, traffic impacts at roadway crossings, and short-term construction noise associated with the operation of heavy equipment. Examples of permanent impacts include gravel fill material used to establish work areas, tree removal, and potential visual impacts.

A description of the Project Route is provided in *Section 5.2*. Related maps and figures are found in Appendices 5-1 and 5-3 of this Application. *Section 5.3* provides an overview of NEP's construction methodology and impact avoidance and minimization measures.

Project impacts to the natural and social environment, as well as proposed mitigation measures, are discussed in *Section 5.4*. In *Section 5.5*, an estimate for the total cost of rebuilding the Existing Lines and Taps is provided. Finally, a summary of the analysis and conclusion are provided in *Section 5.6*.

5.2 Description of the Project Route

5.2.1 Project Route

NEP proposes to replace the Existing Lines and Taps with Rebuilt Lines and Taps within existing ROWs in Massachusetts. The Project Route is illustrated in the Map Book in Appendix 5-1, typical ROW cross-sections are included in Appendix 5-3 and typical structure details are shown in Figure 3-1. The Existing Lines and Taps will be replaced in Millbury, Auburn, Leicester, Spencer, East Brookfield, North Brookfield, West Brookfield, Ware, Belchertown, Pelham, Shutesbury, Leverett, Sunderland, Deerfield, Conway, and Shelburne, Massachusetts.

The Existing Lines and Taps are situated entirely within existing ROWs comprised of NEP easements or land owned in fee. The existing E5/F6 ROW encompasses approximately 67 miles of the Project Route and is, on average, 80 feet to 125 feet wide, with some areas up to 200 feet in easement width. A list of all the Existing Taps with their respective lengths is provided in *Section 2.2.1.* Of those Existing Taps, the Project entails reconstruction of the Quabbin Switch Tap Lines, the Shutesbury Tap Lines and the Deerfield #3 Tap Lines. The construction, re-establishment, and improvement of access will also be required as described in *Section 1*, above and in *Section 5.3.1*, below. Table 5-1 provides a breakdown of each of the Project Route components[12]. and their respective ROW configuration.

Table 5-1: Project Route Components – Approximate ROW Configuration

Project Route Component	Existing ROW Width	Average Maintained ROW Width	Approximate Mileage (rounded to tenth)
Existing E5/F6 Line ROW	Varied width: 80 to 200 feet (ft.) Average Width: 125 ft.	Maintained width: 80-170 ft. Average Existing Maintained Width: 100 ft. Proposed Maintained Width:125 ft.	67
Existing Quabbin Switch Tap Lines ROW	80 to 190 ft *	Average Existing Maintained Width: 80 ft. Proposed Maintained Width:80 ft on ROW and 100 ft. on fee-owned property	0.1
Existing Deerfield Tap Lines	125 ft.	Maintained width: 80-125 ft. Average Existing Maintained Width: 100 ft. Proposed Maintained Width: 125 ft.	0.5
Total			**67.6 miles**

** The Quabbin Switch Tap Lines ROW corridor contains the Quabbin Switch Tap Lines and the B69 Lines. Where they are collocated on ROW, the width is approximately 80 feet. However, the Quabbin Switch Tap Lines are also located on a fee-owned parcel with a width of approximately 190 feet.*

The Rebuilt Lines and Taps will generally be constructed on davit arm monopole weathering steel structures ranging in height from approximately 75 feet to 145 feet above ground (i.e., average 85 feet above ground). The E5/F6 structures will be double circuited, while the Tap structures will be single circuited.

With the exception of the Deerfield #3 and Quabbin Switch Tap Line, the majority of the proposed suspension structures will be direct embedded. Dead-end structures along the Rebuilt Lines will be supported by concrete caisson foundations. The proposed caisson foundations are larger than the existing footprint of the concrete footing supporting the lattice towers, as well as the footprint of existing wood pole structures. Alternative foundation types such as helical piles and micropile foundations may be utilized if warranted by site conditions or other factors.

5.2.1.1 Route Maps

Project Route maps supporting the evaluation of Project impacts are provided in 11-inch by 17-inch format in Appendix 5-1.

5.2.1.2 Land Use Maps

The Land Use Maps, also provided in Appendix 5-1, illustrate land uses within the Project ROWs and an area of 300 feet measured from the edges of the Project Route. Land uses include, exempt

[12] The Shutesbury Tap Lines are not included in the table because they are approximately 130 ft. (0.02 miles) in length and located entirely within NEP fee-owned property.

property,[13] vacant land,[14] industrial, residential, forested and more as described in *Section 5.4.1*. The land use information was obtained from the MassGIS website. Land use mapping from MassGIS is based on 2022 aerial photography, and illustrates existing physical conditions identified by aerial photographs rather than zoning districts. A discussion of applicable zoning information and districts as they pertain to land use is provided for the Project Route in the sections below.

5.2.1.3 Environmental Resources Maps

The Environmental Resources Maps provided in Appendix 5-1 illustrate the natural and social environmental resources within the Project Route. Environmental resources include open space/recreational land, historic/archaeological sites, wetlands and water crossings, vernal pools (certified and potential), rare species habitat, and Outstanding Resource Waters ("ORW"). A detailed description of the environmental resources is presented in *Section 5.4*.

5.2.1.4 Environmental Justice Maps

The EJ Maps provided in Appendix 5-1 illustrate the 2020 EJ block groups, based upon demographic socioeconomic indicators developed by the Massachusetts Office of Energy and EEA within the 1-mile and 5-mile buffer to the ROW. The EJ Maps include demographic data for the residents of each United States Census block group within the 1-mile and 5-mile radius of the Project Route including Minority, Income, and Minority and Income. A summary of the EJ populations in the vicinity of the Project Route is provided in *Section 5.4.13*.

5.3 Construction Methods and Procedures

NEP has long established policies and procedures for minimizing construction related disturbances throughout all phases of construction. NEP and its contractors will follow these procedures for construction of the Project. These policies and procedures include National Grid's ROW Access, Maintenance and Construction Best Management Practices ("BMPs") EG-303NE ("National Grid's BMPs"), provided as Appendix 5-2.

This section describes the general construction methods and procedures anticipated for the Project.

5.3.1 Overhead Transmission Line Construction Sequence

Conventional overhead electric transmission line construction techniques will be used to construct the Rebuilt Lines and Taps. The work will be completed in a progression of activities that will generally proceed as follows:

1. Environmental compliance documentation and training.
2. Removal of vegetation and ROW mowing in advance of construction.

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[13] Exempt Property are properties that qualify from exemption from taxation under various provisions of the law and include public land and facilities, hospitals, schools, churches, and cultural institutions, G.L. c. 59 §5.

[14] According to G.L. c. 59 §2A, vacant land includes developable land, potentially developable land, undeveloped land, and agricultural/horticultural land not included in Chapter 61A. Source - Bureau of Local Assessment. (2019, April). Property Type Classification Codes - Massachusetts. PROPERTY TYPE CLASSIFICATION CODES. Retrieved April 4, 2023, from https://www.mass.gov/doc/property-type-classification-codes-non-arms-length-codes-and-sales-report-spreadsheet/download

3. Installation of soil erosion and sediment controls.
4. Construction of access routes and access route improvements.
5. Construction of work pads and staging areas.
6. Installation of foundations and structures.
7. Installation of conductor, OPGW, and shield wire.
8. Removal and disposal of existing transmission line components.
9. Restoration and stabilization of the ROW.

The following subsections describe the sequence of construction activities that will be used for the installation of the Rebuilt Lines and Taps. In general, Project activities will be sequenced to reduce impacts to the natural and human environment. Project work will be completed in a progression of activities such that construction will not occur along the entire Project ROW all at one time. The Project activities will be conducted in segments along the Line, which reduces the duration of activities within a given segment to less than the overall duration of construction. No long-term impacts on soil, vegetation, surface water, groundwater, wetland resources or air quality will occur.

In addition to construction activities, this section also addresses construction-related issues such as traffic, work hours, equipment, environmental compliance and monitoring, safety and public health considerations, and vegetation maintenance.

Environmental Compliance Documentation and Training

Prior to construction start, NEP and its consultants will develop an Environmental Field Issue guidance document ("EFI") that serves as a resource and field reference for field construction personnel and environmental monitors. It will provide a summary of Project permits and approvals secured to facilitate completion of the Project, as well as a summary of conditions that must be met to ensure compliance for the duration of the Project. In addition, a copy of the Final Decision issued by the Siting Board, and copies of all other permits and approvals, will be provided as attachments for reference and review. The EFIs will be provided to and reviewed by NEP project managers and construction supervisors in advance of construction. These documents will also be provided to the contractor's project manager and construction supervisor prior to construction. Contractors will be required, through their contracts with NEP, to understand and comply with Siting Board conditions or requirements and any other applicable Project permits and approvals. NEP also will require contractors to keep EFIs on site and available to all personnel during construction and throughout restoration.

EFIs, including permit conditions, National Grid's Environmental Guidance and Procedure documents, and Project specific highlights will be reviewed during a construction kick-off meeting and EFI trainings with NEP representatives and contractor personnel. While extensive training will be held for all team members prior to the start of construction, all new/additional contractor personnel supporting the lifecycle of the Project will receive EFI training before commencing work. EFI training typically includes:

- A field orientation/review,
- A description of the natural resources within the Project area,
- A review of the work sequence and work methods (in relation to minimizing impacts to natural resources),

- A review of the Project plans,
- A review of the Project permits and conditions,
- An explanation of National Grid's Environmental Guidance and Procedure documents, which address BMPs, including erosion and sediment control measures that will be employed to minimize or eliminate impacts to sensitive areas, and management of hazardous materials and waste in accordance with 310 CMR 30.000 and 310 CMR 40.1070 (2),
- A review of cultural resources concerns and an explanation of expected procedures and contact information if contractors encounter an unanticipated cultural resource, including stop work authority,
- A review of access routes that will be used to access work areas,
- Safety considerations, and
- Any other information that should be conveyed to ensure compliant completion of the Project.

Tree Removal, ROW Mowing and Removal of Vegetation in Advance of Construction

Within the Project ROWs, mowing or other vegetation management will be required prior to the start of construction to provide access to structure locations, to facilitate safe vehicular and equipment passage, and to provide safe work sites for personnel. Mowing will be completed by mechanical means. Small trees and shrubs will be mowed as necessary with the intent of preserving root systems to the extent practical. Where the Project Route crosses streams and brooks, any necessary vegetation mowing along the stream bank will be minimized to the extent practicable to reduce disturbance of soils and the potential for construction-related erosion.

Tree removal and trimming will also be necessary to maintain required clearances between vegetation and the transmission line structures and conductors for reliable operation of the transmission facilities. The wood from trees removed within the ROWs will be offered to individual landowners, donated to a community wood bank, chipped, and removed from the site or applied to upland areas. In certain environmentally sensitive areas, such as wetland resource areas and buffer zones, it may be necessary and desirable to leave felled trees and/or snags to decompose in place.

Installation of Sediment and Erosion Controls

Following vegetation removal activities, erosion, and sediment control devices such as straw bales, straw wattles, siltation fencing, compost socks, and/or chip bales will be installed in accordance with National Grid's BMPs and approved plans and permit requirements. Installation of erosion and sediment controls may occur concurrently with installation of work pads, pulling pads, and/or access route construction. The installation of these erosion and sediment control devices will be supervised by NEP contractors and reviewed by NEP construction supervisors and/or designated environmental monitors. Erosion and sediment controls will be installed between the work site and environmentally sensitive areas such as wetlands, streams, drainage courses, roads, and adjacent properties when work activities would disturb soil and result in the potential for soil erosion and sedimentation. Erosion and sediment control devices will function to mitigate construction-related soil erosion and sedimentation and will also serve as a physical boundary to delineate resource areas and to contain construction activities within approved areas. NEP contractors, supervisors, and environmental monitors will regularly monitor installed controls.

In addition to those locations described above, 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 stockpiles and other disturbed soil areas are confined and do not result in downslope sedimentation of wetland resources. Where structures requiring concrete foundations are located near wetlands, sedimentation controls will be installed to prevent transport of materials to these downgradient resource areas.

Construction and Improvement of Access

In preparation for construction, NEP will establish the physical access required to construct, inspect, and maintain the Rebuilt Lines and Taps through improvement of existing or historic accessways, temporary placement of construction mats, and construction of new access where necessary. Existing and proposed access routes are shown on the Environmental Resources Maps in Appendix 5-1.

Where upland access is not available, access across wetlands and streams will be accomplished by the temporary placement of construction mats. The use of construction mats allows for heavy equipment access within wetland areas, minimizes the need to remove vegetation beneath the access way, and helps to reduce the degree of soil disturbance, soil compaction, and rutting in soft wetland soils. Construction mats most often used by NEP are wooden timbers, typically bolted together into 4-foot by 16-foot sections. Typically, construction mats are installed on top of the existing vegetation; however, in some instances cutting or mowing woody vegetation may be required.

With respect to necessary stream crossings, construction matting provides a stable crossing while protecting the integrity of the stream bed and banks, thus minimizing impact. Specifically, stream crossings will be bridged using construction mats or other temporary minimally intrusive measures. Where the width of the stream allows, construction mats will be installed to span the entire watercourse without placing stringers in the water. Footers may be placed across the top of the stringers to distribute the weight of the construction equipment and further protect the stream banks. At stream crossings that cannot be spanned by a single section of construction matting, and where permits allow, stringers will be placed atop the stream bed parallel to the flow of water to support the construction mats. In addition, during both installation and removal of the construction mat span/bridge, care will be taken to ensure that the stream bed and banks are not damaged and that the stream flow is not unduly restricted. Depending on the location and sensitivity of the stream/wetland system, installation and removal of stream spans are often conducted under the supervision and direction of a wetland scientist. In addition, sediment controls are implemented to contain any materials used in the mat to access road transitions, if mats are installed in a wetland area.

Access construction and improvements will be carried out in compliance with the conditions and approvals of the appropriate federal, state, and local regulatory agencies. Dust suppression measures, such as the use of water trucks to spray access surfaces, will be implemented as required to minimize fugitive dust from construction vehicle travel along the ROW. Crushed stone aprons/tracking pads will be used at all access entrances to public roadways as needed to minimize the migration of soils off-site from construction equipment. Additionally, stormwater BMPs will be installed as necessary as part of the access construction and improvement phase of the Project. These BMPs will reduce adverse impacts from stormwater flows, maintain the longevity of the access routes, and reduce overall maintenance needs.

Construction of Work Pads, Pulling Pads, and Staging/Laydown Areas

Work pads will be constructed to provide a safe and level work area for construction equipment to undertake foundation work and structure assembly, and to provide adequate space for the live line construction associated with the Project. Mowing of low growing woody vegetation and brush, and grading, may be necessary to create a work pad of approximately 145 feet by 80 to 125 feet at each proposed structure location. The work pads may be slightly smaller or larger depending on terrain, equipment, and overall site conditions at each structure location. Upland work pads will be constructed by grading and/or adding gravel or crushed stone to provide a stabilized work surface. Within agricultural areas and wetlands, work pads will consist of temporary construction matting placed on top of existing vegetation. Once construction is complete, some work pad locations (e.g., those located in environmentally sensitive areas, such as Riverfront Area, floodplain, and potentially rare species habitat) will be stabilized with topsoil and seeded to allow vegetation to reestablish. In some cases, per agency review, stone and gravel will also be removed.

Construction of wire stringing and pulling sites will be required at some angle points and dead-end structures on the Rebuilt Lines to provide a level workspace for equipment and personnel. Upland stringing and pulling sites may require mowing and grading to create a level work surface. Sites in agricultural and sensitive resource areas, such as wetlands and certain areas within the rare species habitat, will consist of construction matting placed on top of vegetation, where feasible. All temporary wire stringing and pulling sites will be restored, stabilized, and allowed to revegetate.

Temporary storage areas, staging areas, and laydown areas will also be needed to support construction. NEP and/or their designated contractor(s) will be responsible for selecting these areas and making arrangements with property owners for use of the land during construction. Selected staging areas and contractor laydown areas will typically be previously developed properties, where environmental resources can be avoided.

Installation of Foundations and Structures

Rebuilding the Existing Lines and Taps requires replacing both steel and wood structures with engineered weathering steel monopole structures to support the Rebuilt Lines and Taps. Monopole structures will be directly embedded into the ground or set upon reinforced concrete caisson foundations. Alternative foundation types such as helical piles and micropile foundations may be utilized if warranted by site conditions or other factors.

Structures supported by concrete caisson foundations will result in approximately 79 square feet of fill (approximately 8 feet in diameter). It is anticipated that there might be some outliers for areas with heavy structural loading, river crossings, etc. Structures installed through direct embedment will result in approximately 50 square feet of fill (approximately 72 inches in diameter). Excavation will be performed using augers or rock drills and depending on field conditions, backhoes and excavators.

For direct embedment structures, a corrugated metal pipe will be placed vertically into the excavated hole and backfilled. The annular space between the pole and the steel casing will then be backfilled with crushed stone. Caissons will be constructed by drilling a vertical shaft, installing casing, installing a steel reinforcing bar cage, placing anchor bolt clusters, pouring concrete, and backfilling as needed. The poles will be field assembled and lifted by cranes, then placed onto either the anchor bolts or into the embedded corrugated metal pipe, for each respective foundation type.

Alternatively, should micropile foundations be installed, a small-diameter non-displacement grouted pile would be utilized. A hole would be drilled into the soil, casing is installed in the hole to the determined cased depth, and the remaining required micropile depth would be drilled into the desired competent layer. Steel reinforcement would be placed into the hole and the drilled hole would be filled with grout using a plastic tremie attached to the steel reinforcement. Grout would be either placed by gravity or pressure grouting. A steel pile cap then would be fastened to the installed piles, and the poles would be lifted by cranes and bolted onto the steel pile cap.

Excavated material will be temporarily stockpiled next to the excavation; however, this material will not be placed directly into wetland resource areas. If a stockpile is in close proximity to wetlands, the excavated material will be enclosed by staked straw bales or other sediment controls. Additional controls, such as watertight spin-off boxes or geotextile filter fabric, may be used for saturated stockpile management in work areas in wetlands (e.g., construction mat platforms) where sediment-laden runoff would pose an issue for the surrounding wetland. Excess excavated soil will be spread over upland areas outside of any applicable wetland buffer zones or other wetland resource areas or removed from the site in accordance with NEP's policies and procedures.

Dewatering may be required during the foundation installation. Groundwater pumped from an excavation would be discharged to an upland area if there is adequate vegetation to function as a filter medium. Where conditions are not adequate for infiltration, water would be pumped into a sediment filter bag within a straw bale/silt fence corral (basin) located within an upland area. The basin and all accumulated sediment would be removed following dewatering operations, and the area would be restored, as needed.

Rock that is encountered during foundation excavation will generally be removed by means of drilling with rock coring augers rather than a standard soil auger. This method allows the same drill rig to be used and maintains a constant diameter hole. However, in some cases, rock hammering and excavation may be used to break up the rock. No blasting is currently anticipated for the Project.

Installation of Conductor and OPGW

Following the construction of transmission line structures, insulators will be installed on the structures. The insulators will isolate the energized power conductors from the structure. OPGW and power conductors will then be installed using stringing blocks and wire stringing equipment. The wire stringing equipment is used to pull the conductors from a wire reel on the ground through stringing blocks attached to the structures 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, railroad crossings, and at crossings of existing utility lines. These guard structures, and similar practices, are used to ensure public safety and uninterrupted operation of other utilities by keeping the wire away from other utility wires and clear of the traveled way.

Helicopter work is not anticipated at this time but may be considered depending on the work methods proposed by the construction vendors. NEP would notify municipal officials, fire, and police departments, and affected landowners, particularly those with livestock, in advance of any helicopter work.

Removal and Disposal of Existing Transmission Line Components

After the Rebuilt Lines and Taps have been placed into service, the existing structures will be removed. The majority of the existing structures are comprised of steel lattice towers. To facilitate their removal, a hydraulic shear will be used to cut and remove the steel lattice towers supporting the Existing Lines, and the steel will be salvaged. Conductors and insulators will also be salvaged and any equipment and debris that cannot be recycled will be transported to an appropriate off-site disposal facility. Handling of such materials will be performed in compliance with applicable laws and regulations and in accordance with NEP policy.

Wood pole structures will be removed in their entirety unless the complete removal of the pole would create an adverse impact to environmentally sensitive areas. The resulting hole will be backfilled and thoroughly tamped to minimize settling, then capped with native topsoil and allowed to revegetate. NEP will transport used wood poles to the nearest ROW street crossing that is accessible by truck for subsequent pick up. Treated wood poles will be transported for disposal at a licensed landfill or incinerator. All cross-arms, braces, and other hardware will be removed from the site and disposed of properly.

Restoration and Stabilization of the ROW

Typical restoration efforts, including removal of construction debris, final grading, and stabilization of disturbed soil, will be completed following construction. Existing stone walls and fences will be restored in accordance with property owner agreements and applicable local ordinances. Where authorized by property owners, permanent gates and access roadblocks will be installed at key locations to restrict access onto the ROW by unauthorized persons or vehicles.

Regulated environmental resource areas temporarily or permanently disturbed by construction will be restored or replicated in accordance with applicable permit conditions. The Company will work with each community's Conservation Commission or authorized representative (i.e., Agent), as well as Massachusetts Department of Environmental Protection ("MassDEP") and United States Army Corps of Engineers ("USACE") to ensure restoration complies with all performance standards in applicable wetlands regulations and permits, as well as each municipal Order of Conditions. All disturbed areas around structure work pads and other graded locations will either be stabilized with a gravel surface or vegetated. Erosion control blankets, or similar, may be used to stabilize the soil in accordance with applicable regulations. Temporary sediment control devices will be removed following the stabilization of disturbed areas.

Construction mats will be removed following completion of construction, and areas will be restored to reestablish pre-existing topography and hydrology, as necessary.

NEP's environmental monitor(s) will inspect restored areas in accordance with *Section 5.3.2*.

5.3.2 Environmental Compliance and Monitoring

NEP will retain the services of environmental compliance monitors to observe civil construction activities, including the installation and maintenance of soil erosion and sediment control BMPs, on a routine basis to ensure compliance with all federal, state, and local permit commitments. NEP's Environmental Monitor(s) will have the necessary expertise in wetlands protection. In addition, per the requirements outlined in the U.S. Environmental Protection Agency's ("EPA") Construction General Permit ("CGP"), Environmental Monitors will also be "qualified persons" who have, at a minimum, either completed the EPA construction inspection course and have passed the exam; or hold a current valid construction inspection certification or license from a program that covers principles and practices of erosion and sediment control and pollution prevention practices at construction sites, proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites; and performance of inspections, including the completion of required reports and documentation, consistent with the CGP.

In addition, NEP will require that its construction contractors designate a construction supervisor or equivalent to be responsible for coordinating with the environmental monitor and for regular inspections and compliance with permit requirements. This person, or the team involved, will be responsible for ensuring EFI training and any other appropriate training has been provided, and members of the construction crew receive direction regarding work methods as they relate to permit compliance and construction mitigation commitments. Daily tailboard meetings will occur including a review of the day's environmental requirements and considerations. Regular construction progress meetings will be held to reinforce contractor awareness of these mitigation measures.

In addition, and as part of the EFI mentioned in *Section 5.3.1* above, NEP will develop and maintain a Stormwater Pollution Prevention Plan ("SWPPP") and Soil Erosion and Sediment Control Plan for the Project. The SWPPP will identify controls to be implemented to avoid and minimize the potential for erosion and sedimentation from soil disturbance during construction. The SWPPP will include a construction personnel contact list, a description of the proposed work, stormwater controls and spill prevention measures, and inspection practices to be implemented for the management of construction-related stormwater discharges from the Project. The SWPPP will be adhered to by the contractors during all phases of Project construction in accordance with the general conditions prescribed in the Project's EPA Stormwater CGP. As necessary, deficiencies of erosion and sediment control measures and other permit compliance matters will be immediately brought to the attention of the contractor's construction supervisor for implementation of corrective measures.

Post construction, NEP will monitor mitigation associated with impacted environmental resources in accordance with the federal, state, and local permitting conditions specified for the Project. At a minimum, NEP's standard is to monitor the restoration of impacted wetlands and waterways and mitigation areas annually during the growing season following construction to ensure wetland areas are stable and support 75% vegetative cover. NEP's environmental monitor(s) will inspect restored areas to ensure there are no noticeable adverse effects to the plant community, soil characteristics, and micro-topography. Should the environmental monitor observe adverse effects, or if the restoration timelines are not in compliance with permit conditions, the Company will perform additional corrective actions, such as hand grading, seeding, or mulching. After all work has been satisfactorily completed and vegetation has been reestablished to a minimum of 75% cover, all non-biodegradable materials (e.g., siltation fencing, straw bale strings, stakes, straw wattle mesh casing, etc.) shall be disposed of properly off-site. NEP will work with each community's representative (i.e., Agent) as well as MassDEP, Natural Heritage and Endangered Species Program ("NHESP"), and USACE to ensure observed restoration complies with all performance standards in applicable wetland regulations and permits.

5.3.3 Construction Traffic

Intermittent construction-related traffic will occur over the entire construction period. Construction equipment will typically gain access to the Project Route from public roadways crossing the ROW in various locations. Because each of the construction tasks will occur at different times and locations over the course of construction, traffic will be intermittent at these entry roadways. Traffic will consist of vehicle types ranging from pick-up trucks to heavy construction equipment.

NEP's contractors will coordinate closely with state transportation authorities to develop acceptable Traffic Management Plans ("TMPs") for work within state highway layouts. NEP will coordinate with local authorities for work on local streets and roads. At locations where construction equipment must be staged in a public way, the contractors will follow a pre-approved work zone traffic control plan. Further traffic information is provided in *Section 5.4.10*. As necessary, NEP will notify affected landowners in advance of any use of off-ROW access and will work on a case-by-case basis with any abutting landowners that express concern.

5.3.4 Construction Work Hours

Construction activities and related deliveries will be limited to 7:00 a.m. to 7:00 p.m. on weekdays and 8:00 a.m. to 5:00 p.m. on Saturdays, with no construction on Sundays or state/federal holidays. 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. Wire stringing across highways or railroads may also be required to occur outside normal work hours. Construction hours will be developed in consultation with the relevant municipalities, the Massachusetts Department of Transportation ("MassDOT"), and the Massachusetts Bay Transportation Authority ("MBTA").

Some municipalities have specific limits on construction work hours (for instance, Sunderland and Conway), but the majority determine work hours on a case-by-case basis. NEP will work closely with each of the municipalities to negotiate mutually agreeable work hours. In addition, during construction, NEP will assign a community outreach representative to keep abutting property owners and municipal officials informed about the Project as it progresses along the ROW through each community.

5.3.5 Safety and Public Health Considerations

NEP will construct and maintain the proposed Project so that the health and safety of the public is protected. This will be accomplished through adherence to all federal, state, and local regulations, and industry standards and guidelines established for protection of the public. Practices that will be used during construction will include, but not be limited to, establishing traffic control plans for construction traffic on busy streets to maintain safe driving conditions, restricting public access to potentially hazardous work areas, and using temporary guard structures at road and electric line crossings to prevent accidental contact with the conductor during installation.

In addition, NEP implements safety measures based upon site-specific conditions associated with each individual work area and proposed work activity, including potential temporary barricades in high human use areas such as residential, industrial, and commercial areas. In agricultural areas, NEP will coordinate with underlying landowners to ensure that animals typically pastured within a work site are either relocated to a temporary pasture, timing of the work is sequenced to fall when a particular pasture is not in use, and/or temporary gates and fences are installed to keep livestock out of work areas. In areas adjacent to public ways, the Company will utilize TMPs that include signage, flaggers, and other traffic controls as necessary to support the safe execution of the relevant scope of work in addition to temporary guard structures and other such protective measures (as required by permit conditions) during wire pulling activities.

Prior to construction, NEP will ensure all contractors are familiar with and understand NEP's detailed public safety measures. All safety measures will conform to NEP's Safety Procedures and Work Area Protection Manual. Site-specific measures in this document include traffic control, excavation protection, exclusionary fencing, warning signs/devices, safety and orientation training for all crew members, and general housekeeping. Additionally, contractors are required to complete Occupational Safety and Health Administration ("OSHA") training that specifies the requirements for adequate sanitation and the proper disposal of unsanitary waste on the construction site.

Following construction, all transmission structures will be clearly marked with warning signs to alert the public to potential hazards if climbed or entered. Throughout the Project design and implementation sequence, NEP will evaluate locations that may require the installation of signs, and/or other types of barriers (e.g., large stones) at access points from public roads.

5.4 Environmental Impact Analysis

This section describes the existing conditions along the Project Route, presents an analysis of potential impacts to specific resources as a result of Project construction, and describes the measures NEP proposes to undertake to avoid, minimize, and mitigate such impacts.

Categories of potential impacts considered include land use, protected lands and open space, historic and archaeological resources, tree removal, wetlands and water resources, rare species habitat, noise, visual, traffic and transportation, EMFs, climate change, and EJ considerations. Data on natural and social environmental resources were compiled for the Project Route using field collected data and most recently available MassGIS data and mapping.

5.4.1 Land Use and Sensitive Receptors

The Project Route is predominantly located within existing ROW corridors held in fee or easement by NEP[15]. Project construction will be generally contained within existing NEP ROWs and along h

[15] The vast majority of NEP's ROW corridors are held through easements, with only a small percentage of properties along a ROW held in fee. Land held in fee, also known as fee simple, is the ownership of land and, in most cases, the buildings and structures located thereon. An easement is a nonpossessory, irrevocable legal interest in another party's land for a specific purpose. In NEP's case, as an easement holder, NEP typically has a right to access the landowner's property and to construct, operate and maintain a transmission line along a ROW corridor.

istorically utilized access routes. However, additional property rights are needed for access and ROW design, including select new pole and wire locations. For the remainder of the Project Route, there are no anticipated permanent changes to abutting land uses associated with construction of the Project.

NEP has evaluated land uses within the Project ROWs, as well as adjacent lands within 300 feet, to identify potential impacts to abutting stakeholders during construction. To identify land uses along the route, MassGIS land use data layers were overlaid onto aerial photographs, field investigations were completed to confirm existing conditions, and Project-specific land use categories and maps were created by combining MassGIS data with information collected in the field. As listed in Table 5-2, land uses along the Project ROW are predominantly exempt properties, and vacant land, interspersed with residential areas, and industrial uses. Within 300 feet of the Project ROW, land uses are predominantly exempt properties and residential areas, interspersed with mixed use and vacant land. Land use types along the Project Route are also shown in the Map Book in Appendix 5-1.

Table 5-2: Land Uses Within the Project ROWs and 300-foot Buffer to ROW

Project Route		
Land Use Type	**Within Existing ROWs (Acres)**	**300-foot Buffer to Existing ROWs (Acres)**
Agricultural/Horticultural	41	185
Commercial	12	67
Exempt Property	264	1,328
Forest Land	86	391
Industrial	167	367
Mixed Use	138	708
Recreation	17	73
Residential	167	1,032
Transportation	2	147
Unknown*	2	4
Vacant	221	645
Water	7	86
Total	**1,125**	**5,033**

** Based on guidelines developed by the Department of Revenue, each Board of Assessors determines the proper classification of property according to its use. "Unknown" Land Use has not yet been classified by the applicable municipality and/or passed the MassGIS Quality Assurance procedures required for publishing.*

As shown in Table 5-2, the primary land use on the Project ROWs and within 300 feet consists of approximately 1,592 acres combined of exempt property. Exempt property associated with the Project includes land owned primarily by municipalities, local town governments, state agencies, religious organizations, conservation groups, and the Department of Conservation and Recreation ("DCR"). Municipal lands include the Walter Cowls Jones Working Forest Wildlife Conservation Easement ("WCE") in Shutesbury, the High Ledges Wildlife Sanctuary in Shelburne, the Totman Farm Agricultural Preservation Restriction ("APR") in Conway, and the Bradwell Farms

Shelburne. DCR properties include the Connecticut River Greenway State Park, Daniel S. Horgan Memorial Skating Rink, Quabbin Reservoir Watershed, South River State Forest, Spencer State Forest, and West Brookfield State Forest.

Secondarily, approximately 221 acres on the Project ROW and 645 acres within 300 feet are classified as vacant land use. Vacant land includes developable land, potentially developable land, undeveloped land, and agricultural/horticultural land. Vacant land is predominantly located in Shelburne, Conway, Deerfield, Sunderland, Leverett, Ware, West Brookfield, North Brookfield, East Brookfield, Spencer, Leicester, Auburn and Millbury.

Within 300 feet of the Project ROW, residential areas are the second most dominant land use. Of the total residential land uses within 300 feet, the majority are located in Spencer, Millbury, and Auburn. Within the Project ROW, residential land uses occur primarily at Nicole Drive, Woodland Street, and Elm Court in Millbury, and Leicester Street in Auburn. Per the current version of the MassGIS standardized assessors' parcel data set, there are 123 local roads/residential access routes and 55 private driveways that directly cross the ROW.

Industrial development accounts for approximately 167 acres on ROW and 367 acres within 300 feet. Industrial land use is predominantly found in the towns of Auburn, Conway, and Shelburne. These land uses include NEP's Millbury #1 Substation in Millbury, and solar fields in East Brookfield, Leicester and North Brookfield.

Sensitive receptor land uses are defined as public facilities including hospitals, elder care facilities and nursing homes, public and private schools, cemeteries, licensed daycares, district courts, police stations, fire stations, and places of worship. There are no sensitive receptors within the Study Area, however, Table 5-3 below provides the land use type within 300 feet of the Project ROW and number of receptors/units associated within each land use type. The receptor/unit counts relate to the number of land use dependent entities/properties within the buffer distances. Properties include any portion of a parcel classified as that land use type. Units include residential dwellings and commercial or industrial buildings/structures relevant to the land use type listed.

Table 5-3: Land Use Receptors and Units

Land Use Type	Number of Receptors		Sensitive Receptor Land Uses
	Properties	Units	
Agricultural/ Horticultural	18	0	0
Commercial	11	0	0
Exempt Property	70	3	0
Forest Property	30	0	0
Industrial	47	13	0
Mixed Use	54	1	0
Recreational Property	8	0	0
Residential	302	19	0
Vacant	109	4	0
Transportation	10	0	0
Unknown	2	3	0
Water	10	0	0
Total	671	43	0

5.4.1.1 Avoidance, Minimization, and Mitigation

There are no anticipated permanent changes to abutting land uses associated with construction of the Project along the Project Route. The Rebuilt Lines and Taps are replacing Existing Lines and Taps within the E5/F6 corridors held in fee or easement by NEP. This is consistent with the existing and surrounding utility infrastructure and current land uses. While Project construction may result in temporary impacts to abutting stakeholders, the Project infrastructure is not anticipated to interfere with any residential, business, or other public facilities.

A construction communication outreach plan will be developed for the Project that will provide outreach during construction and a consistent point of contact for the public. Recognizing the varying needs of its stakeholders, NEP is developing various communication methods to inform stakeholders of construction activities, including, as needed: work area signage; advance notification of scheduled construction; personal contact with residents, community groups, and businesses; and regular e-mail updates to residents (upon request) and local officials that will include information on upcoming construction activity. A public website (https://cmatowmaenergy.com) has been made available for this Project which provides details of the Project, an interactive map, and contact information.

As discussed in further detail in the Sections that follow, NEP will mitigate temporary impacts related to noise (*Section 5.4.9*) and traffic and transportation (*Section 5.4.10*). With the implementation of these measures, the anticipated impacts of the Project on adjacent land uses will be minimized.

5.4.2 Protected Lands, Open Space and Recreation

Within areas classified as protected lands or open space and recreation, Project construction is predominantly contained within existing NEP ROWs and along historically utilized access routes. As such, there are no anticipated permanent changes to open space and recreational land uses associated with construction of the Project along the Project Route. However, NEP has evaluated protected lands and properties used for open space and recreation within the Project ROWs, as well as adjacent lands within 300 feet, to identify potential impacts to abutting stakeholders during construction.

Protected open space and recreational land uses were identified using the MassGIS Protected and Recreational Open Space data layer[16] and are depicted in the Map Book in Appendix 5-1. Table 5-4 shows a summary of all Open Space and Recreation Resources identified for the Project. As part of this analysis, NEP also evaluated Areas of Critical Environmental Concern ("ACECs")[17]. No ACECs are located in the Project ROW or within 300 feet of the ROW.

[16] MassGIS (Bureau of Geographic Information); December 2021.

[17] ACECs are identified as environmentally significant places in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources.

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Table 5-4: Open Space and Recreation Resources[18]

Municipality	Site Name	Agency	Owner	Primary Purpose
Auburn	Auburn Recreation Complex	Local	Town of Auburn	R
	Daniel S. Horgan Memorial Skating Rink	State	DCR - Division of State Parks and Recreation	R
	Water Tank	Local	Town of Auburn	W
	Ball Field	Local	Millbury Auburn Realty Trust Cable Al	R
	Hillside Cemetery	Local	Town of Auburn	H
Belchertown	Quabbin Reservoir Watershed	State	DCR - Division of Water Supply Protection	W
Conway	Deerfield River (USGen New England) - Great River Hydro Conservation Restriction ("CR")	Local	Great River Hydro	C
	South River State Forest	State	DCR - Division of State Parks and Recreation	B
	Shallcross Agriculture Restriction ("AR")	Local	Shallcross, Bruce R and Alice L	A
	Totman Farm Agriculture Preservation Restriction ("APR")	Local	Totman, Leland K and Betty A	A
Deerfield	Bar Way Farm Inc.	Local	Melnik	A
	Bridges DLT APR	Local	Bridges, Richard D	A
	New England Forestry Foundation - Tabak Forest CR	Local	New England Forestry Foundation	B
	New England Forestry Foundation - Pine Nook Forest CR	Local	New England Forestry Foundation	C
	Deerfield River (USGen New England) - Great River Hydro CR	Local	Great River Hydro	C
	Connecticut River Greenway State Park	State	DCR - Division of State Parks and Recreation	B
	Mill Village	Local	Mill Village Inc and Walter Melnik	A
	Localio CR	Local	Localio, Arthur and Ruth	C
Leicester	Hillcrest Country Club	Local	Town of Leicester	W
	Meadow Lake Park	Local	Meadow Lake Association	R
	Meadow Lake Beach	Local	Meadow Lake Association	R
	Memorial School	Local	Town of Leicester	R
Leverett	Teawaddle Hill Farm CR	Local	Teewaddle Trust	C
	East Leverett Meadow Conservation Area	Local	Rattlesnake Gutter Trust	C
	Kuzmeski CR	Local	Kuzmeski, Paul W	C
	Bates Sanctuary	Local	Rattlesnake Gutter Trust	C
	Walter Cowls Jones Working Forest WCE	Local	W. D. Cowls Inc.	C
	Williams Family Conservation Area	Local	Town of Leverett	C
	Adams Family Conservation Area	Local	Town of Leverett	C
	Heronemus Forest	Local	Kestrel Land Trust	C
	Schuyler CR	Local	Schuyler, Robert and Evelyn	C
Millbury	Elmwood Street & Shaw Schools Recreational Fields	Local	Town of Millbury	R
North Brookfield	Fullam Hill Road Conservation Area	State	Town of North Brookfield	C
	Edwards George L APR	Local	Edwards, George L and Hanna S	A
	North Brookfield Town Forest	Local	Town of North Brookfield	C
	Donovan Road Conservation Area	Local	Town of North Brookfield	C
Pelham	Amherst Water Supply Land	Local	Town of Amherst	W
	Cook-Johnson Cemetery	Local	Town of Amherst	H
	Robinson Road Conservation Area	Local	Town of Pelham	C
	Buffam Brook Community Forest	Local	Kestrel Land Trust	C
	Buffam Brook Road Conservation Area	Local	Town of Pelham	C
	Quabbin Reservoir Watershed	State	DCR - Division of Water Supply Protection	W
	Amherst Watershed	Local	Town of Amherst	W
	Cadwell Memorial Forest	State	Commonwealth of Massachusetts	C

[18] This list contains G.L. c. 59 §2A - Land which is not otherwise classified, and which is not taxable under the provisions of Chapter 61, 61A or 61B, or taxable under a permanent conservation restriction, and which land is not held for the production of income but is maintained in an open or natural condition and which contributes significantly to the benefit and enjoyment of the public. Chapter 61, 61A, 61B Property Being Classified as Open Space Source might overlap with Exempt Property above. Source - Bureau of Local Assessment. (2019, April). Property Type Classification Codes - Massachusetts. PROPERTY TYPE CLASSIFICATION CODES. Retrieved April 4, 2023, from https://www.mass.gov/doc/property-type-classification-codes-non-arms-length-codes-and-sales-report-spreadsheet/download

Municipality	Site Name	Agency	Owner	Primary Purpose
Shelburne	Deerfield River (USGen New England) - Great River Hydro CR	Local	Great River Hydro	C
	High Ledges Wildlife Sanctuary	Local	Massachusetts Audubon Society	C
	Bassett Road CR	Local	Ashenden Rebecca C and Marcy John	C
	Bradwell Farms CR	Local	Bradwell Farms	C
Shutesbury	Walter Cowls Jones Working Forest WCE	Local	W. D. Cowls Inc.	C
	Amherst Watershed	Local	Town of Amherst	W
	Conservation Area	Local	Town of Amherst	C
Spencer	Holy Rosary Cemetery	Local	Roman Catholic Bishop of Worcester	H
	O'Gara Park	Local	Town of Spencer	R
	Spencer Fish and Game Club	Local	Spencer Fish and Game Club	R
	Spencer State Forest	State	DCR - Division of State Parks and Recreation	B
	Bixby Road CR	Local	South Middlesex Non-Profit Housing Corporation	C
Sunderland	Mt. Toby Wildlife Management Area	State	Department of Fish and Game	C
	Shilling	Local	Shilling, Carolyn Whitmore	A
	Connecticut River Greenway State Park	State	DCR - Division of State Parks and Recreation	B
	Patterson Donald F Jr APR	Local	Patterson, Donald F Jr and Susan T	A
	Connecticut River Greenway State Park	State	DCR - Division of State Parks and Recreation	B
Ware	Ware Water Supply Land	Local	Town of Ware	W
	Quabbin Reservoir Watershed	State	DCR - Division of Water Supply Protection	W
	Frohloff Farm	Local	East Quabbin Land Trust	C
West Brookfield	Rock House Reservation	Local	The Trustees of Reservations	C
	Kibbe Corydon W APR	Local	Kibbe, Corydon W and Nancy N	A
	West Brookfield State Forest	State	DCR - Division of State Parks and Recreation	B
	Pynchons Grist Mill	Local	East Quabbin Land Trust	C
R: Recreation (activities are facility based) - W: Water Supply Protection - H: Historic / Cultural - C: Conservation (activities are non-facility based) – B: Recreation and Conservation - A: Agricultural				

NEP identified 50 federal, state, private, municipal, and non-profit owned open space lands located within or adjacent to the Project ROWs, consisting of a total of approximately 2,181 acres of open space. Of this, 377 acres are within the Project ROW, and 1,804 acres are within 300 feet of the Project ROW. The primary purposes of these protected lands include recreation, conservation, water supply protection, and cultural/historical. Many of these areas provide year-round recreational opportunities such as hiking and nature study, and seasonal activities such as fishing. The majority of the open space areas located adjacent to the Project ROWs provide scenic views and are often associated with rivers, reservoirs, wetlands, streams, rivers, and state forests.

DCR owns and manages reservoirs, conservation lands, and state forests within 300 feet of the Project ROW. These properties account for 167 acres of land within the Project ROWs, and approximately 802 acres of land within 300 feet. The largest state forest area is the South River State Forest in Conway. South River State Forest is a protected forest popular for hiking and outdoor pursuits. The Project ROW runs along the eastern boundary of the forest, and a number of trails either transect or start/end near the ROW. DCR trails vary in type from forest roads and trails with natural surfaces to processed gravel, varying in width and condition. The other state forests consist of the Spencer State Forest in Spencer, and West Brookfield State Forest in West Brookfield. These DCR properties offer opportunities for recreational activities to residents and visitors. Several multi-use trails intersect the existing ROWs. DCR trails vary in type from forest roads and trails with natural surfaces to processed gravel, varying in width and condition. Additionally, the Project ROW is adjacent to the Quabbin Reservoir Watershed in Belchertown. Quabbin Reservoir is one of the largest unfiltered waters supplied in the country. Similarly, the Project ROW also crosses through the Connecticut River Greenway State Park, which is a protected environment with public recreation features that consists of open spaces, scenic areas, archaeological and historical sites, as well as critical wildlife and plant habitats.

The majority of Project construction activities will take place within the existing ROWs to minimize impacts to adjacent open spaces. NEP's easements for the Existing Lines and Taps predate the establishment of DCR properties and state forests in these areas. NEP holds easements that grant rights for the construction and maintenance of towers, poles, wires, and other structures for the transmission of electric power in these locations. The Project has been designed to utilize existing access within NEP easements wherever feasible. However, temporary improvements to existing off-ROW access will be required within State Forest lands. Any off-ROW access improvements will be restored in coordination with DCR as part of the Construction & Access Permit process.

5.4.2.1 Avoidance, Minimization, and Mitigation

The Project Route is predominantly located within existing ROWs held in fee or easement by NEP. Rebuilding the Existing Lines and Taps along the Project Route is consistent with the existing use of these ROWs. Since the Project will continue to support utility infrastructure, it is not anticipated to interfere with any long-term existing or future land uses.

NEP will provide notification of the intended construction plan and schedule to any affected abutters so that the effect of any temporary disruptions may be minimized. To mitigate temporary construction-phase disturbances to public open spaces, specifically existing trail systems, NEP will coordinate with the affected stakeholders and will develop an outreach plan to include safety signage and temporary detours around active construction zones. Normal operation at all facilities will continue and existing land uses will be allowed to continue following construction.

Some wildlife habitat functions associated with forested areas will be permanently altered as a result of tree removal; however, they will be replaced with the increasingly scarce scrub/shrub habitat. Post-construction stabilization and restoration of the ROWs will also facilitate natural revegetation on the ROW and reestablish available wildlife habitats on the ROW.

With the implementation of these measures, the anticipated impacts of the Project on protected, open space, and recreational lands will be minimized.

5.4.3 Historic and Archaeological Resources

As part of the federal consultation process under Section 106 of the National Historic Preservation Act ("NHPA"), NEP's cultural resource consultant, The Public Archaeology Laboratory ("PAL"), initiated a cultural resource due diligence review for the Project in June 2022 to identify historic architectural properties, archeological sites, and other cultural resources within the Project's Area of Potential Effects ("APE"), and to make recommendations regarding consultation with the Massachusetts Historical Commission ("MHC"), office of the State Historic Preservation Officer ("SHPO"), and any appropriate additional cultural resource investigations. Additional field work to identify historic architectural properties was conducted in the fourth quarter of 2024 and work is ongoing. PAL also started an archaeological survey of the Project APE in October 2022 and work is on-going. PAL plans on submitting the archaeological and architectural reports to the MHC, and federally and state recognized Tribes in the second quarter of 2025.

To date, a total of 22 above-ground resources have been inventoried within or overlapping the Project ROW consisting of 19 districts and three individual resources. Of the 19 districts, four are listed on the National Register. None of the individual resources have been evaluated for National Register listing. Four post-contact archaeological sites and 12 pre-contact archaeological sites have been inventoried within or overlapping the Project ROW. None of the pre-contact sites within the Project ROW have been evaluated as to their National Register eligibility, except for one site in Deerfield that was determined ineligible for listing. NEP will continue to consult with the MHC, USACE, Native American Indian Tribes, and other stakeholders to avoid, minimize, or mitigate any effects the Project may have on historic properties, including the development of any related archaeological site avoidance and protection plans and associated treatment measures, if needed.

5.4.3.1 Avoidance, Minimization, and Mitigation

The Project Route is located within established ROWs associated with the Existing Lines and Taps. For the majority of the Project Route, the Rebuilt Lines and Taps and associated tree removals are not expected to impact the existing viewshed from abutting above ground resources. Construction within the ROW has the potential to impact archaeological sites depending on the depth and extent of planned ground disturbance in relation to archaeological resources.

The Project is subject to review under Section 106 of the NHPA ("Section 106") and will require a permit from the USACE. The Project will also be subject to review by the MHC under G.L. c. 9, §§ 26–27C. NEP will coordinate with the USACE and MHC to incorporate avoidance and/or minimization measures as needed to avoid adverse effects to potential National Register of Historic Places ("NRHP") eligible or -listed cultural resources. As part of the USACE Section 404 permit review, and pursuant to Section 106, the USACE will also consult with federally recognized Native American Indian Tribes that express an interest in the cultural resources that may be affected by the Project.

NEP will continue to coordinate with PAL, in consultation with MHC and the USACE, to identify historic, archaeological, or cultural resources prior to construction and to avoid, minimize, or mitigate impacts to cultural and historic resources. Any protection or avoidance measures required to avoid or minimize impacts to significant resources will be outlined in an Avoidance and Protection Plan. While Project specific, Avoidance and Protection Plans typically include instructions to be incorporated into construction documents and delivered to construction personnel. No access to site areas is allowed and protective fencing is put in place with signage. No ground disturbance within site areas is permitted, including no vegetation removal, no parking of vehicles, no equipment storage, and no collection of artifacts. Site conditions are to be documented before and after the construction process.

Procedures to handle unanticipated discoveries during construction will be specified as part of a Post Review Discoveries Plan. In addition, in the event of an unanticipated cultural resource discovery, NEP EFI procedures (see *Section 5.3.1*) include stopping the work activity at the location of the potential discovery and notifying the Company's environmental lead, environmental monitor, and archaeological contractor and/or appropriate authorities. Avoidance measures will be put in place and documentation completed (if necessary). Authorities include the local medical examiner for potential human remains and the State Archaeologist or archaeological reviewer for potential historic finds.

5.4.4 Tree Removal

As described in *Section 5.4.1*, the Project ROWs primarily traverse forested, exempt properties. To provide a safe area for construction, future maintenance, and operation, and to ensure the reliability of the Rebuilt Lines and Taps, NEP will remove trees in select locations along the edges of the existing Project ROWs as follows:

- The E5/F6 ROW is currently maintained clear of tall woody vegetation to approximately 100 feet wide on average throughout the corridor. NEP is proposing to remove trees in select locations to maintain approximately 125 feet of its 80-to-200-foot-wide ROW.
- The Quabbin Switch Taps ROW is currently maintained clear of tall woody vegetation to approximately 80 feet wide on average throughout the corridor. NEP is proposing to remove trees in select locations to maintain the 80-foot width. Where the Quabbin Switch Tap is located on fee-owned property, approximately 100 feet of the 190-foot width will require select tree removal.
- The Deerfield Taps ROW is currently maintained clear of tall woody vegetation to approximately 100 feet wide on average throughout the corridor. NEP is proposing to remove trees in select locations to maintain the entire 125-foot-wide ROW.

The Rebuilt Lines and Taps will also need to continue to comply with clearance requirements set forth in the NERC document FAC-003-4 "Transmission Vegetation Management".

To determine the acreage of the proposed tree removals within the Project ROWs, NEP used Light Detection and Ranging ("LiDAR") data to measure, digitize, and assess vegetation heights and existing canopy along the Project Route to determine the risk of vegetation falls on the Rebuilt Lines and Taps. This analysis, coupled with field reviews, allowed NEP to determine where tree removal will be required to ensure conformance with the appropriate vegetation management operating criteria within the ROWs, and where trimming, pruning, or other management techniques will be sufficient. Lower growing shrubs identified during this analysis will be allowed to remain in all areas not required for construction work pads and access ways.

For tree removal off-ROW, only trees required to safely accommodate passage of construction equipment and vehicles will be removed.

Table 5-5 provides the breakdown of anticipated tree removals both on and off-ROW. Refer to Environmental Resources Maps in Appendix 5-1.

Table 5-5: Proposed Tree Removal for the Project Route

Tree Removal Location	Project Route (on-ROW) (acreage)19	Access (off-ROW) (acreage)
Forested Uplands	161	58
Forested Wetlands 20	20	1
Subtotal Tree Removal	181	59
Total Tree Removal	**240 Acres**	

Temporary impacts to wildlife are anticipated in association with tree removal along the forested edge of the Project Route, but they will be minimal. Forest edges already exist due to the presence of the existing ROW, and large blocks of intact woodland adjacent to the ROW will not be impacted and will remain for wildlife use. Mobile species such as large mammals white-tailed deer (*Odocoileus virginianus*) and birds are expected to temporarily relocate from construction areas but are unlikely to be permanently impacted by the displacement. Small mammals such as gray squirrels (*Sciurus carolinensis*), woodchucks (*Marmota monax*), and possibly furbearers (skunks and raccoons), as well as herpetofauna have smaller home ranges and are less mobile. Tree removal will cause changes to their local habitats, and they are unlikely to relocate. Some individuals may be directly impacted by tree removal activities and habitat alteration, but these species are abundant and population level impacts are unlikely. Additionally, the early-stage habitat maintained in the ROW is suitable or preferred for a wide range of species currently present, and the incremental increase in the size of the ROW will be beneficial to them.

5.4.4.1 Avoidance, Minimization, and Mitigation

Utilizing the existing ROWs associated with the Project Route greatly minimizes the need for new tree removal for the Project. Specifically, the majority of the Project Route consists of the existing E5/F6 ROW, which has been actively maintained for over a century. Therefore, the Project Route likely predated many of the adjacent land uses, and the vegetation maintenance cycle has regularly modified the landscape on- and off-ROW for decades. Similarly, the Tap Lines have been refurbished and subject to regular maintenance cycles.

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[19] Rounded to the nearest 100th. Acreage includes the approximate, existing canopy cover to be removed as a result of trees being removed from within the ROW.

[20] Wetlands include local, state, and federal freshwater wetlands as defined in the Federal Clean Water Act (33 U.S.C. §§ 1251 et seq., Section 404 and Section 401), Massachusetts Wetlands Protection Act (“MWPA”) (G.L. c. 131 § 40) and Regulations (310 CMR 10.00), and local bylaws/ordinances for each municipality along the Project Route. These wetlands include all field delineated Bordering Vegetated Wetland (“BVW”) within and adjacent to the Project ROW.

Due to the avoidance and mitigation measures summarized above, tree removal proposed in forested wetlands is minimal (2% of the overall wetland acreage). However, where necessary, felled trees and/or snags and slash piles may be left in place and may provide some wildlife habitat features. As feasible, trees may be topped to offer wildlife habitat benefits. Low scrub/shrub plant communities will be left intact with the exception of access routes where temporary construction matting is proposed. Areas permanently maintained as low-growing, herbaceous, or scrub/shrub communities will have appropriate conservation seed mixes applied to bare soil surfaces. This promotes biodiversity, provides pollinator habitats, and ecologically valuable community types.

Prior to tree removal, trimming, and mowing, the boundaries of wetlands will be clearly marked to prevent unauthorized vehicular encroachment into wetland areas. Appropriate forestry techniques will be implemented within wetlands to minimize ground disturbance. Other sensitive resources, such as cultural resource features and NHESP state-listed plant species, will be flagged and encompassed with protective fencing prior to removal of vegetation on the ROW. Temporary construction mats will be used to gain access to and across wetlands, to minimize wetland disturbance, and to provide stable platforms for safe equipment operation.

NEP anticipates the final mitigation package will be developed during the federal, state, and local permitting processes outlined in the next section, and that the package will fully address the required permit conditions and agency concerns. If required or otherwise determined to be necessary, a mitigation plan using native plant species may be implemented to supplement the reestablishment of vegetation.

5.4.5 Wetlands, Water Resources and Vernal Pools

The Project's wetland, watercourse, and vernal pool impacts have been minimized to the greatest extent practicable by utilizing ROWs associated with the Existing Lines and Taps and existing access ways where feasible. However, given the scale and landscape setting of the Project, certain wetland impacts cannot be avoided.

The assessment of wetlands and watercourses within the Project ROWs is based on field reviews and wetland delineations performed for the Project in Summer and Fall of 2022, and Winter of 2024. The vernal pool assessment and identification of wetlands, water crossings, and vernal pools located outside of the Project ROWs is based on field delineations and the following digital data layers:

- MassDEP Wetlands Data[21]
- USGS National Hydrography Data ("NHD")[22]
- MassGIS NHESP Certified Vernal Pool ("CVP") Maps[23]

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[21] MassGIS. 2017. MassGIS Data: MassDEP Wetlands. Retrieved October 26, 2022 from https://www.mass.gov/info-details/massgis-data-massdep-wetlands-2005#downloads-.

[22] United States Geological Survey. 2016. NHD Viewer. Retrieved May 26, 2021, from https://nhd.usgs.gov/NHD_High_Resolution.html.

[23] MassGIS. 2024. MassGIS Data: NHESP Certified Vernal Pools. Retrieved February 2, 2024 from https://www.mass.gov/info-details/massgis-data-nhesp-certified-vernal-pools.

Table 5-6 below summarizes the wetlands, watercourses, and vernal pools associated with the Project, which are also depicted in the Map Book in Appendix 5-1.

Table 5-6: Wetlands, Watercourses, and Vernal Pools Associated with the Project

Resources	Units	Existing Wetlands along Project Route		Potential Impacts (acreage)		
		ROW1	Off-ROW*	Temporary	Secondary	Permanent
Wetlands[24]	**Acreage**	**234**	**25.5****	**43.8**	**21.6**	**0*****
Streams (Perennial)	**Number**	**58**	**11**	**0.53**	**0.56**	**0**
Streams (Intermittent)	**Number**	**159**	**122**	**0.43**	**0.72**	**0**
Certified Vernal Pools	**Number**	**3**	**7**	**0**	**0******	**0**

** Based on field delineated data of NEP overhead transmission line ROW and digital data listed above.*
*** Calculated for within 30 feet of the access routes.*
**** Rounded to the nearest tenth. Equivalent to a total of 1,507 square feet.*
***** Rounded to the nearest tenth. Equivalent to a total of 261 square feet.*

In summary, a total of 259.5 acres of wetlands were identified along the Project Route. Approximately 234 acres of wetlands were identified within the Project ROWs, and 25.5 acres were delineated off-ROW adjacent to Project activities (e.g., access improvements). Wetlands are found sporadically throughout the entire Project Route. These wetlands typically consist of scrub/shrub, emergent marsh, or wet meadow communities. In accordance with the federal classification system found in Cowardian (1979),[25] Palustrine Forested Wetlands, Palustrine Emergent Wetlands, and Palustrine Scrub Shrub Wetlands, were identified on the existing ROWs.

Construction will result in temporary, secondary, and permanent impacts to wetland resources. Temporary impacts associated with the construction of the Project include placement of construction matting, secondary impacts include tree removal, and permanent impacts include fill associated with the installation of the structures. Based on preliminary design, construction of the Project will result in approximately 43.8 acres of temporary impacts, 21.6 acres of secondary impacts, and zero acres (or 1,507 square feet) of permanent impacts to wetlands.

5.4.5.1 Avoidance, Minimization, and Mitigation

To reduce the impacts associated with the construction and operation of the Project, NEP incorporated design measures to minimize permanent impacts and BMPs to minimize temporary alterations associated with construction. In addition to using existing ROWs, design measures include utilizing existing access routes and avoiding the placement and construction of structures

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[24] Wetlands include local, state, and federal freshwater wetlands as defined in the Federal Clean Water Act (33 U.S.C. §§ 1251 et seq., Section 404 and Section 401), MWPA (G.L. c. 131 § 40) and Regulations (310 CMR 10.00), and local bylaws/ordinances for each municipality along the Project Route. These wetlands include all field delineated BVW within and adjacent to Project ROW.

[25] The Cowardin system is used by the USFWS for the National Wetlands Inventory. In this system, wetlands are classified by landscape position, vegetation cover and hydrologic regime. The Cowardin system includes five major wetland types: marine, tidal, lacustrine, palustrine, and riverine.

and access in wetlands and watercourses where possible. This has resulted in the avoidance and minimization of impacts to wetlands, watercourses, and vernal pools to the greatest extent practicable, resulting in only 1,507 square feet of permanent impact.

Additional impact minimization measures include utilizing temporary construction mats for wetland access and work pads instead of permanent fill (i.e., stone, or similar) and selective tree removal where feasible for off-ROW access. As described in *Section 5.3.1*, NEP will install and maintain erosion and sediment controls throughout construction, as well as other typical measures described in National Grid's BMPs. NEP is currently in the preliminary phases of discussions with the USACE, MassDEP, and NHESP, and will be consulting with all applicable Conservation Commissions, to develop an appropriate mitigation package so there is no net loss of wetland functions and values as a result of the Project. Examples of possible wetland mitigation strategies include wetland restoration, targeted property acquisition for land preservation, and participation in the USACE Massachusetts in-lieu fee program. Permit applications to be submitted to state and federal regulatory agencies will provide the specific mitigation information required for the Project. At the local level, NEP will work with local Conservation Commissions to discuss impacts and proposed mitigation as part of the Notice of Intent process. In addition, post construction, NEP will prepare applications for Certificates of Compliance from each of the Conservation Commissions. These Certificates ensure that wetland resources have been restored, and losses have been mitigated, as applicable.

NEP is committed to developing a mitigation package that will address impacts of the Project. It is anticipated that mitigation will result in no net loss of existing wetland functions values and statutory interests within the watershed. While Project information presented herein is thorough with regard to impacts, and proposed mitigation measures are identified and described, NEP is still evaluating specific details related to wetland mitigation.

5.4.6 Rare Species Habitat

Impacts to rare species have been minimized to the greatest extent practicable by utilizing existing, managed ROWs and existing access routes where feasible. The vegetation maintenance cycle and ROW maintenance and improvements have modified the landscape on and off the ROW for decades. However, improvements to access and construction of new access and work pads will temporarily and permanently alter habitats within the ROWs.

To assess the potential for plant and/or animal species listed as state or federally endangered, threatened, and/or special concern to be present along the Project Route, NEP reviewed MassGIS 2021 Priority and Estimated Habitat data layers, solicited database information from the NHESP, and reviewed the Project Route for federal species using the United States Fish and Wildlife Service ("USFWS") Information for Planning and Consultation ("IPaC") tool, which is available on their website.

The USFWS IPaC review determined that four federally listed species may be present within the Project area, consisting of a threatened mammal, a candidate insect, an endangered plant, and a threatened plant. Additionally, based on NHESP data layers and information, the Project Route contains habitat for 26 state-listed species (four bird, three reptile, five invertebrates, one fish, and13 plant species), along portions of the Project Route in the towns of Spencer, East Brookfield, North Brookfield, West Brookfield, Ware, Belchertown, Shutesbury, Leverett, Sunderland, Deerfield, Conway, and Shelburne. Specific species are not identified herein at the NHESP's request.

The Priority Habitat ("PH") data layer available from MassGIS depicts approximately 222 acres, or 19.3% of the ROW, within rare species habitat. Based on the preliminary Project design, approximately 48 acres (44.1 acres upland, 3.8 acres wetland) of tree removal, and approximately 28.5 acres of temporary matting (17 acres upland, 11.3 acres wetland) is proposed in PH. Additionally, approximately 40 acres (all upland) of permanent impacts associated with access and work pad improvements is proposed. The permanent impacts to PH will occur within the towns of East Brookfield, Spencer, Ware, Belchertown, West Brookfield, North Brookfield, Shelburne, Sunderland, Shutesbury, Deerfield, Conway, and Leverett. Consultation is ongoing with NHESP to determine if any of these impacts will constitute a "take" of state-listed species.

During the regulatory review process, NHESP staff will review activities proposed within rare species habitat to determine whether the Project will impact state-listed species and their habitats. If it is determined that a proposed action will result in a "take" and cannot be revised to avoid a "take," then NEP will file for the issuance of a Conservation and Management Permit ("CMP") and take action to meet the performance standards for the CMP.

5.4.6.1 Avoidance, Minimization, and Mitigation

In addition to using existing, managed ROWs and access to the maximum extent practicable, habitat information obtained through desktop assessments and field surveys was used to design the Project to avoid and minimize impacts to rare species habitat where feasible. Wherever possible, permanent impacts to PH will be minimized by limiting the extent of access and work pads to the minimum safe size required for conducting utility line maintenance work. Tree removals will follow guidelines from NHESP.

In addition to avoiding and minimizing species and habitat impacts to the maximum extent feasible, NEP is working closely with NHESP to develop mitigation measures for each species associated with the Project Route. At this time, proposed mitigation includes, but is not limited to, the following:

- Habitat restoration;
- Species-specific protection plans;
- Protective enclosures and fencing;
- Extensive "sweeps" and monitoring during construction; and
- Training for construction personnel.

Consultation with NHESP is ongoing and NEP will implement the necessary actions to avoid, minimize, and mitigate Project-related impacts to comply with the Massachusetts Endangered Species Act ("MESA") permit issued for the Project. If, after consultation with NHESP, it is determined that a "take" will occur, a CMP will be prepared to comply with MESA. Mitigation options under a CMP may include, but are not limited to, funding of programs that directly benefit the affected species, on-site and/or off-site habitat protection and/or creation. Off-site habitat protection typically requires the acquisition of land, under fee ownership or Conservation Restriction ("CR"), for permanent habitat conservation. Other mitigation options include financial contribution toward land acquisition, conservation research funding, habitat management, or other programs that directly benefit the affected species. With the implementation of these measures, impacts on rare species and their habitats as a result of the Project will be minimized.

5.4.7 Public Water Supplies

The existing Project ROWs traverse various public water supply resources as summarized in Table 5-7. However, potential impacts are anticipated to be negligible and associated with construction only.

Public water supplies can be sourced from either groundwater aquifers or surface waters. To identify public water supply areas within the Project ROWs, the following resources were used:

- MassGIS ORW Datalayer (2010)[26]
- MassGIS Aquifers (2007)[27]
- MassGIS Approved Wellhead Protection Areas (Zone II, Zone I, IWPA) Datalayer (2022)[28]
- USGS NHD Waterbody (2022)[29]
- MassGIS Major Watershed (2000)[30]

As stated in 310 CMR 22.02, a Zone II Wellhead Protection Area is defined as: "that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation). It is bounded by the groundwater divides which result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock."

MassGIS Aquifer Dataset maps show high, medium, and low yield aquifers. The definition of high and medium yield varies between panels, as it does on the source manuscripts. Medium yield aquifers for most basins are between 100 and 300 gallons per minute ("gpm"); however, this range may vary greatly from basin to basin. High and low yield definitions vary from basin to basin as well.

MassDEP has established a category of waterbodies known as ORWs, which are designated in the Massachusetts Surface Water Quality Standards Regulations (314 CMR 4.00) and include high quality waters with socioeconomic, recreational, ecological and/or aesthetic values. Class A Public Water Supplies, their tributaries and NHESP CVPs are classified as ORWs. Other waters can be

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[26] MassGIS. 2010. MassGIS Data: Outstanding Resource Waters. Retrieved March 18, 2024 from https://www.mass.gov/info-details/massgis-data-outstanding-resource-waters#downloads.

[27] MassGIS. 2007. MassGIS Data: Aquifers. Retrieved March 18, 2024 from https://www.mass.gov/info-details/massgis-data-aquifers#downloads.

[28] MassGIS. 2024.MassDEP Wellhead Protection Areas (Zone II, Zone I, IWPA). Retrieved July 29, 2024 from https://www.mass.gov/info-details/massgis-data-massdep-wellhead-protection-areas-zone-ii-zone-i-iwpa#downloads.

[29] USGS. 2022. NHD Waterbody. Retrieved March 18, 2024 from https://www.usgs.gov/national-hydrography/access-national-hydrography-products.

[30] MassGIS. 2000. MassGIS Data: Major Watersheds. Retrieved March 18, 2024 from https://www.mass.gov/info-details/massgis-data-major-watersheds#downloads.

specifically designated by the MassDEP as ORWs. Replacement structures, temporary construction mat access, pull pads, and work envelopes are proposed within wetlands mapped as ORWs associated with Atkins Reservoir, Ludlow Reservoir and Quabbin Reservoir. Public water supply information and aquifer locations for the Project Route are provided in the Map Book in Appendix 5-1.

Table 5-7: Public Water Supplies Traversed by the Project

Resource Areas	Name	Project Route (acres)
Zone II	Deerfield Fire District, Cherry Valley/Rochdale Water District, Auburn Water District, Spencer Water Department, Sunderland Water District. Ware Water Department	70
Aquifers	Deerfield River Basin, Connecticut River Basin, Chicopee River Basin, and Blackstone River Basin	132
ORWs	Amethyst Brook, Ludlow Reservoir, Atkins Reservoir, and Quabbin Reservoir.	159
Water Supply Watersheds	Deerfield, Connecticut, Chicopee, and Blackstone	155
Reservoirs	Atkins Reservoir, Ludlow Reservoir, and Quabbin Reservoir.	137

5.4.7.1 Avoidance, Minimization, and Mitigation

Potential impacts to surface water supplies could occur only as a result of unanticipated failure of sedimentation and erosion controls during construction. Therefore, impacts to public water supply sources are not anticipated. However, if an impact were to occur as a result of construction activity, it would be negligible. Potential impacts to groundwater supplies could occur from spills of fuel or hydraulic oil related to the construction equipment. Equipment used for the construction of the Rebuilt Lines and Taps will be properly maintained and operated to reduce the chances of spill occurrences of petroleum products. Refueling equipment will be required to carry spill containment and prevention devices (i.e., drip pans, absorbent pads, etc.) and fueling of equipment will only occur in upland areas, unless equipment cannot be moved. No blasting will occur within Zone II Wellhead Protection Areas along the Project Route.

Proposed structures and work areas for the Project have been sited to avoid permanent impacts to ORWs to the extent practicable. In locations where ORWs cannot be avoided, sediment and erosion controls will be implemented to minimize sediment migration outside of the limits of disturbance. Any temporary construction matting will be removed immediately after the construction activities are complete. Any required restoration or stabilization, after the mat removal, will be completed as the equipment and vehicles de-mobilize from the ROW. Additionally, NEP will work closely with DCR for work within the Quabbin Reservoir.

It is anticipated that most tree and vegetation removal will be done mechanically. The Project will comply with the National Pollutant Discharge Elimination System ("NPDES") CGP and SWPPP requirements, requirements of the Section 401 Water Quality Certification, Massachusetts Wetlands Protection Act ("MWPA") and implementing regulations, and other restrictions as may be applied by the local Conservation Commissions in accordance with the MWPA.

Appropriate sediment and erosion control, spill prevention, and response measures will be implemented, and these controls will be closely monitored and managed. NEP will require its contractors to adhere to BMPs regarding the storage and handling of oil and potentially hazardous materials during the Project. Equipment used for the construction of the Rebuilt Lines and Taps will be properly maintained and operated to reduce the chances of spill occurrences of petroleum products. Refueling equipment will be required to carry spill containment and prevention devices (e.g., drip pans, absorbent pads).

Following construction, the normal operation and maintenance of the transmission line facilities will have no impact on public water supply resources. Vegetation management within sensitive areas, including public water supply areas, will follow the same procedures as are currently used on the ROW.

5.4.8 Visual Impact Assessment

This section describes the potential visual impacts of the Project from properties and public ROWs located adjacent to or within close proximity to the Project.

Most of the Project Route traverses exempt properties that are predominantly densely forested areas where structures are only seen from road crossings, open water, open fields, and occasional commercial or residential uses directly adjacent to the ROW as shown in Land Use Maps in Appendix 5-1. Since the Rebuilt Lines and Taps will be located predominantly within the existing ROWs, tree removal will be minimized and limited to discrete areas where the ROWs have not been fully maintained and where additional tree removal is required to achieve compliance with vegetation management standards. Therefore, existing vegetation will provide some screening.

For this Project, 21 key viewpoints were identified where there is a potential for greater visibility and/or sensitivity to views of new structures. Each location/viewpoint is accessible to the public via highways, roads, sidewalks, and publicly owned land. In Table 5-8, entitled Viewpoints to the Project ROW, each location is identified by a View number, street name, and municipality.

Table 5-8: Viewpoints to the Project ROW

Viewpoints from Public Streets		
Location	**Viewpoint**	**Description**
Providence St, Millbury	View 2	Represents view of the rebuilt structure from the street adjacent to residential property along Providence Street.
S Main and Rice Rd, Millbury	View 4	Represents view of the rebuilt structure from the street adjacent to residential property along S Main and Rice Road.
Woodland St, Millbury	View 6	Represents view of the rebuilt structure from the street adjacent to residential property along Woodland Street.
Woodland St, Millbury, MA	View 7	Represents view of the rebuilt structure from the street adjacent to residential property along Woodland Street.
Nicole Dr, Millbury	View 18	Represents view of the rebuilt structure from the street adjacent to residential property along Nicole Dr.
Greenwood St, Millbury	View 20	Represents view of the rebuilt structure from the street adjacent to residential property along Greenwood Street.
Ridgewood Dr, Auburn	View 51	Represents view of the rebuilt structure from the street adjacent to residential property along Ridgewood Dr.
Leicester St, Auburn	View 68	Represents view of the rebuilt structure from the street adjacent to residential property along Leicester Street.
Bunker Hill Rd, Leicester	View 86	Represents view of the rebuilt structure from the street adjacent to residential property along Bunker Hill Road.
Douglas Dr, Leicester	View 109	Represents view of the rebuilt structure from the street adjacent to residential property along Douglas Dr.
Ferncroft Rd, Leicester	View 110	Represents view of the rebuilt structure from the street adjacent to residential property along Ferncroft Road.
Greenville St, Spencer	View 112	Represents view of the rebuilt structure from the street adjacent to residential property along Greenville Street.
Ash St, Spencer	View 127	Represents view of the rebuilt structure from the street adjacent to residential property along Ash Street.
Smith and Hanson Rd, West Brookfield	View 198	Represents view of the rebuilt structure from the street adjacent to residential property along Smith and Hanson Road.
Shea Rd, West Brookfield	View 217	Represents view of the rebuilt structure from the street adjacent to residential property along Shea Road.
Madden Rd, West Brookfield	View 218	Represents view of the rebuilt structure from the street adjacent to residential property along Madden Road.
Old Gilbertville Rd, Ware	View 256	Represents view of the rebuilt structure from the street adjacent to residential property along Old Gilbertville.
Old Gilbertville Rd, Ware	View 256	Represents view of the rebuilt structure from the street adjacent to residential property along Old Gilbertville.
Old Gilbertville Rd, Ware	View 257	Represents view of the rebuilt structure from the street adjacent to residential property along Old Gilbertville.
Cushman Rd, Leverett	View 455	Represents view of the rebuilt structure from the street adjacent to residential property along Stillwater Road.
Stillwater Rd, Deerfield	View 558	Represents view of the rebuilt structure from the street adjacent to residential property along Stillwater Road.

Visual renderings were prepared from these observation points. Appendix 5-4 depicts existing and simulated future conditions at these representative locations along the Project Route.

The Existing Lines and Taps are presently visible to varying degrees from all 21 viewpoints listed in Table 5-8. The Existing Lines generally include the following structures:

- Grey steel lattice structures ranging from 40 to 80 feet high on the E5/F6 Lines.
- Grey steel monopole structures ranging from 60 to 95 feet high on the E5/F6 Lines.
- Various wood multi-pole structures ranging from 50 to 90 feet high on the E5/F6 Lines.
- Wooden monopole structures at 40 to 50 feet high on the Deerfield Tap Lines.
- Wooden monopole structures at 35 to 40 feet high on the Quabbin Tap Lines.

The existing monopoles are more visually solid than lattice structures.

The proposed replacement structures will be taller than the existing structures. Proposed structures range from 70 to 145 feet high (averaging 85 feet in height, above ground), an increase in average height of approximately 10 feet on the E5/F6 Lines. The visual contrast between existing views is most distinct where the height of the new structures extends above adjacent vegetation and can be discerned more clearly and/or from a greater distance. In many instances new structures on the horizon will be more visible than the existing structures.

In cases where brown weathering steel monopoles are visible against the sky, they may represent a greater contrast than grey or galvanized structures. However, when viewed against the tree line by a person standing at close proximity to the poles, the weathering steel structures are less discernable against dark backgrounds (e.g., vegetation) as compared to galvanized poles from the same perspective. Only limited vegetation removal will be required in the Project ROW to accommodate the installation of the monopole structures. Therefore, the color of the structures will have little impact on change in visibility.

The majority of locations where structures are visible are where they cross public roads. For some residents, such as the view to Structure 20, the primary view change is within or behind the property. To better understand how this change presents at landscape scale refer to Appendix 5-4.

Overall, the potential for visual impact along the Project Route has been minimized through use of existing ROWs associated with the Existing Lines and Taps. These ROWs are located primarily in undeveloped and forested areas with relatively few residential or commercial abutters.

5.4.8.1 Avoidance, Minimization, and Mitigation

Impacts from the Project will be minimized due to the limited need for tree removal in locations near sensitive viewers and the location of the Project within managed ROWs. NEP will work with abutting landowners who experience a material change in view as a result of construction to determine reasonable and practical screening that could be provided on their properties.

During the Project's restoration phase, representatives from the Company and a landscaper to be retained by the Company will meet with those individual landowners whose views have materially changed as a result of construction of the Project and who have expressed the desire for visual mitigation, to discuss what reasonable and feasible screening can be provided. Screening options may be in "soft" form (e.g., vegetation) or "hard" form (e.g., fencing), or a combination of the two. The type of visual screening will be determined through a collaborative conversation between the landowner, the landscaper and the Company. Ultimately, the type of screening that is chosen will be based on feasibility and cost.

With the implementation of these measures, the visual impact of the Project will be minimized.

5.4.9 Noise

This section evaluates the potential for noise impacts from construction of the Project. The Project is not anticipated to generate noise during operation; consequently, noise impacts associated with the Rebuilt Lines and Taps will be limited to the construction period, which currently is anticipated to extend from April 2029 to November 2034, following the transmission line construction sequence described in *Section 5.3.1.* Construction is expected to occur during typical work hours, though in specific instances, at some locations, or at the request of a municipality or state agency, NEP may seek municipal approval to work at night. The noise ordinances applicable to the municipalities that the planned construction will affect are shown in Table 5-9.

Table 5-9: Municipal Noise Ordinance and Bylaw Summary[31]

Municipality Code	Allowed Construction Hours		Exceptions/Decibel Limits
	Weekday	Weekend	
Town of Shelburne Zoning Bylaw 21.12.6 (c) and (d)3	7:00 a.m. - 7:00 p.m.	Not Permitted	The noise generated during construction or operation will adhere to the Massachusetts Department of Environmental Protection's Division of Air Quality Noise Regulations (310 CMR 7.10), as amended, and will not exceed the average ambient noise level by more than 5 A-weighted decibel ("dB(A)"). Additionally, sound levels will remain below 40 dB(A) during the day and 30 dB(A) at night to align with typical rural or quiet residential area standards. NEP will work with the town to ensure compliance with applicable bylaws, as required.
Town of Conway Zoning Bylaw 12.12 (i) (ii) a., b., c., and d.	7:00 p.m. and 7:00 a.m.	Not Permitted	The noise generated during construction shall comply with the provisions of the Massachusetts Department of Environmental Protection's Division of Air Quality Noise Regulations (310 CMR 7.10), as amended, or the provisions of this Bylaw, whichever is more restrictive. A sound source will be in violation of this Bylaw if it: Increases the broadband sound level by more than 5 dB(A) above pre-construction ambient levels during construction and operation, or increases broadband sound by more than 5 C-weighted decibel ("dB(C)") above pre-construction levels; Produces a "pure tone" condition where an octave band center frequency sound pressure level exceeds the two adjacent center frequencies by three decibels or more; Results in noise levels exceeding 35 dB(A) during the day or 30 dB(A) at night,

[31] Noise ordinance and Bylaw information was not available for the towns of Shutesbury, West Brookfield, North Brookfield, East Brookfield, Spencer, and Leicester.

Municipality Code	Allowed Construction Hours		Exceptions/Decibel Limits
	Weekday	Weekend	
			consistent with rural or quiet residential standards; or For low-frequency sounds (octave center frequencies ≤125 Hertz (“ Hz”), produces a maximum noise level outside the property boundary exceeding 40 dB(C). NEP will work with the town to ensure compliance with applicable bylaws, as required.
Town of Deerfield Article 7 (Zoning)	Not Specified	Not Specified	No person shall operate or permit the operation of any sound source that produces a sound level exceeding 80 dBA or 10 dBA above ambient levels, whichever is lower, as measured at the property boundary of the receiving land use. NEP will coordinate with the town to ensure compliance with applicable bylaws, as required.
Town of Sunderland Chapter 125, Zoning Bylaws Section 3(E)	Not Specified	Not Specified	No use shall be allowed if it will cause sound, noise, vibration, odor or flashing (except for warning devices, temporary construction or maintenance work, No use shall be permitted if it generates sound, noise, vibration, odor, or flashing (excluding warning devices, temporary construction or maintenance, parades, recreational, or agricultural activities) that is perceptible without instruments beyond 200 feet from the boundaries of the originating premises. For uses adjacent to or within sensitive areas, such as wilderness areas, wildlife preserves, historical site areas, etc., no use shall cause sound, noise, vibration, odor, or flashing perceptible without instruments beyond the originating premises.
Town of Leverett Code of the Town Chapter 127	10:00 p.m. -6:30 a.m.	10:00 p.m. - 6:30 a.m.	The bylaw does not prescribe specific decibel level limits. Additionally, the prohibitions outlined in the previous section do not apply to or restrict highway and utility maintenance or construction, including necessary excavation or repairs of bridges, streets, highways, or public utility installations conducted by or on behalf of the town, any public utility, or any agency of the Commonwealth of Massachusetts.
Town of Pelham Zoning Bylaw §125-21. B (2)	9:00 p.m. - 7:00 a.m.	9:00 p.m. - 7:00 a.m.	The bylaw does not prescribe specific decibel level limits. However, no person shall engage in or cause noisy construction activities on a site abutting a residential use between 9:00 p.m. and 7:00 a.m.

Municipality Code	Allowed Construction Hours		Exceptions/Decibel Limits
	Weekday	Weekend	
Town of Belchertown Chapter 145 Zoning 145-32. B (2)	10:00 p.m. and 7:00 a.m.	10:00 p.m. and 7:00 a.m.	The maximum permissible sound-pressure level of any continuous, regular, or frequent source of sound produced by any use or activity shall not exceed 70 dB(A) at the property line from 7:00 a.m. to 10:00 p.m. and 60 dB(A) from 10:00 p.m. to 7:00 a.m. NEP will work with the town to ensure compliance with applicable bylaws, as required.
Town of Ware	7:00 a.m. -9:00 p.m.	7:00 a.m. - 9:00 p.m.	The maximum permissible sound-pressure level from any continuous, regular, or frequent source of sound produced by any use or activity shall not exceed 70 dB(A) from 7:00 a.m. to 9:00 p.m. and 60 dB(A) from 9:00 p.m. to 7:00 a.m. NEP will work with the town to ensure compliance with applicable bylaws, as required.
Town of Auburn Zoning Bylaw 9.4.6.6	Not Specified	Not Specified	Noise beyond the property line shall not exceed the average level of street and traffic noise, and shall not be objectionable in terms of intermittence, beat frequency, or shrillness. NEP will work with the town to ensure compliance with applicable bylaws, as required.
Town of Millbury	Not Specified	Not Specified	No use shall cause sound, noise, vibration, odor, or flashing perceptible beyond 400 feet from the property boundaries, except in specific cases like warning devices or temporary work. The Building Inspector may require proof of compliance via engineering analysis or examples of similar facilities. A permit issued based on this evidence certifies the town's acceptance of the structure and equipment, but any future changes must also comply with the standards. NEP will work with the town to ensure compliance with applicable bylaws, as required.

Construction of the Rebuilt Lines and Taps will require the use of various types of equipment during the construction sequence. The duration of construction activities outlined in Table 5-9 will vary on a site-by-site basis depending on several factors such as the amount of vegetation removal and mowing to occur, nature of the terrain, the subsurface conditions associated with a particular foundation location, and the type of structure being installed.

Table 5-10 identifies the types of equipment to be used for each phase of construction and provides a range of typical sound levels from the equipment at a specific location and for the Project as a whole, as well as typical durations by activity. The typical sound levels are provided at a distance of 50 feet from the source and have also been extrapolated for noise levels at 100, 200, and 300 feet. The estimated noise levels range from 80 A-weighted decibel ("dBA") to 98 dBA at a distance of 50 feet from the construction activity.

Table 5-10: Typical Construction Sound Levels Along the Project Route

Description of Activity	Types of Equipment	Typical Sound Levels at 50 Feet (ft) (dBA)	Estimated Typical Sound Levels (dBA) at Various Distances from Noise Sources			Typical Durations (Approximate)
			100 ft	200 ft	300 ft	
Vegetation Removal and ROW Mowing	Grapple trucks Bulldozers Track-mounted mowers Motorized tree shears Log forwarders Chippers, Chain saws Box trailers	84 to 98	78 to 92	72 to 86	69 to 83	One day per 2000 ft of access and work area mowing One day per 1000 ft for vegetation removal
Erosion/Sediment Controls and Access Route Improvements and Maintenance	Dump trucks Bulldozers, Excavators, Backhoes Graders, Forwarders 10-wheel trucks with grapples, Cranes	80 to 93	74 to 87	68 to 81	65 to 78	One day per 500 linear ft for graded access and work areas One day per 300 linear ft for matted access and work areas
Installation of Foundations and Structures	Backhoes and Excavators Rock drills mounted on excavators Cluster drills with truck mounted compressors Concrete trucks Cranes Aerial lift equipment Tractor trailers	80 to 90	74 to 84	68 to 78	65 to 75	Two days per direct embed foundation, 5 days per concrete caisson foundation One day per suspension structure, two days per dead-end structure
Conductor and Shield Wire Installation	Puller-tensioners Conductor reel stands Cranes Bucket trucks Flatbed trucks	80 to 93	74 to 87	68 to 81	65 to 78	Five days per mile of conductor install/removal One day per mile of shield wire install/removal
Removal and Disposal of Existing Transmission Line Components	Cranes Flatbed trucks Pullers with take-up reel Excavators	80 to 90	74 to 84	68 to 78	65 to 75	One half day per tower
Restoration of the ROW	Bulldozers Excavators Tractor-mounted York rakes Straw blowers Hydro-seeders	80 to 90	74 to 84	68 to 78	65 to 75	One day per 1000 linear ft for graded access and work area One day per 500 linear ft of matted access and work area

As shown in Table 5-11, there are few residential areas that are within the ROW or touch the edge of the ROW. Residences within 50 feet, 100 feet, 200 feet and 300 feet of the Existing Lines and Taps may potentially be impacted by construction noise during one or more phases of construction. However, typical sound levels of construction noise experienced at any given residence will be temporary and intermittent.

Table 5-11: Residential Areas Within or Abutting the ROW

Project Component	Closest Residence (ft)	Residences within 50 ft of ROW	Residences between 50-100 ft of ROW	Residences between 100-200 ft of ROW	Residences between 200-300 ft of ROW	Total residences within 300 ft
E5/F6 ROW	25	133	102	194	198	627
Deerfield Sub Taps #3	442	0	0	0	0	0
Quabbin Switch Taps	Unknown	0	0	0	0	0

5.4.9.1 Avoidance, Minimization, and Mitigation

To the extent practicable, NEP will comply with the noise ordinances in the municipalities within which the Project is proposed. The Company will mail notifications to abutting residents in advance of scheduled work in their neighborhood, providing dates, times, and a description of the work. As part of this notification, NEP will flag anticipated activities that may be louder than typical construction. Updates will also be placed on the Project website. NEP will coordinate with abutters over the life of the Project to determine if there are any specific schedule constraints that can be introduced to address abutter concerns, such as not working on a specific weekend due to an event at an abutting residence.

On a limited basis, work occurring per scheduled outages and other work tasks, once started, may require continuous operation until completion outside of planned work hours (including Sundays and holidays). These tasks include concrete pours associated with concrete caisson foundations and wire stringing activities. The decibel levels are as outlined in Table 5-9 as it relates to "Installation of Foundations and Structures" (80 to 93 decibels) and "Conductor and Shield Wire Installation" (80 to 93 decibels). The duration of a concrete pour is typically scheduled to last a full ten-hour working day as concreting must be completed in a continuous, monolithic pour. The duration of wire stringing activities for any single wire varies depending upon the length of the wire pull. Wire stringing is typically planned at a rate of installing one wire (a single phase of conductor or a single shield wire) per day in any given wire pulling section. Wire stringing activities and the installation of concrete caissons will be necessary in residential areas. In these instances, NEP will seek advanced approval from the applicable municipality and provide notice to abutters.

Temporary noise impacts from construction equipment will be mitigated by maintaining equipment in good working condition and by the use of appropriate mufflers. Noise sources that may operate continually during the day, such as generators or air compressors, will be located away from populated areas to the extent possible. NEP and its contractors will also comply with state law (G.L. c. 90, § 161A) and MassDEP regulations (310 CMR 7.11(1)(b)), which limit vehicle idling to no more than five minutes, to the greatest extent feasible based upon the construction task, type of equipment/vehicle, and weather conditions. There are exceptions for vehicles being serviced, vehicles making deliveries that need to keep their engines running, and vehicles that need to run their engines to operate accessories. Where construction takes place adjacent to residences, NEP will notify landowners in advance of construction and will provide a point of contact for Project related questions and concerns. With the implementation of these measures, noise impacts associated with the Project will be minimized.

Information specific to Project noise protocols, rules, and regulations are provided in bid documents, part of contract requirements, and discussed during pre-bid and pre-construction meetings. NEP holds weekly meetings during construction with the contractor responsible for the successful delivery of the Project. Overall progress and compliance with permit and contract requirements are discussed at each meeting. Additionally, the Company will employ construction field supervisors to oversee the construction of the Project in accordance with contract documents. The construction field supervisor will be on-site daily.

5.4.10 Air Quality

The Project will not have any permanent air quality impacts and will not generate any permanent air quality emissions. Limited and temporary air quality impacts are anticipated during the construction of the Project due to vehicle and equipment exhaust and dust creation. Table 5-10 lists typical equipment that may be used during construction.

5.4.10.1 Avoidance, Minimization, and Mitigation

Air quality impacts associated with the Project will be temporary in nature and confined to the amount of time necessary for construction. NEP will mitigate air quality impacts during the construction process by carefully coordinating construction phasing; implementing established policies and procedures for minimizing construction related impacts; and requiring its contractors to implement air quality and dust control measures on-site throughout the construction period in compliance with National Grid's BMPs guidance document.

Dust control measures such as water sprays during excavation, stockpiling, and loading of demolition and soil materials for removal, and site watering to mitigate wind erosion, will be implemented as required to minimize dust from construction activities and vehicle travel along the ROW. Additional measures, such as secure covering of piles of excavated materials, properly secured covers on truck cargos during materials transport, and minimization of the free drop height of excavated or aggregate material during earthwork operations will be implemented to reduce other sources of dust. Tire cleaning areas at construction vehicle entrances and exits and street sweeping of adjacent local roadways will address potential sediment accumulation.

Emissions from construction equipment and transport of construction materials will be minimized in accordance with Massachusetts' anti-idling law, G.L. c. 90, § 16A, c. 111, §§ 142A–142M, and 310 C.M.R. 7.11. NEP limits vehicle idling time to five minutes except when engine power is necessary for delivery of materials or to operate accessories to the vehicle, such as power lifts.

NEP requires contractors to use Ultra-Low-Sulfur Diesel in off-road diesel vehicles. NEP will also comply with MassDEP's Diesel Retrofit Program. The Program requires that all diesel-powered non-road construction equipment with 50 or more horsepower used for 30 or more days during Project construction will either be EPA Tier 4–compliant or will have EPA-verified (or equivalent) emission control devices installed. Such devices include oxidation catalysts or other comparable technologies.

With respect to enforcement of the idling restrictions, it is the responsibility of every person on a job site to be in full compliance with all safety and environmental rules and policies. Supervisors and foremen at job sites are responsible for enforcement of these rules on a continuous basis, and environmental inspections will be conducted on a weekly basis.

5.4.11 Traffic and Transportation

The Project will not have any permanent traffic impacts and post-construction traffic impacts will be limited to those associated with occasional ROW and transmission line maintenance activities. However, limited temporary construction-related impacts are anticipated for the Project. Potential traffic impacts were evaluated using the MassGIS Open Data Portal. Roadways are identified by four functional classification system categories developed by MassDOT as shown in Table 5-12.

Table 5-12: Roadways Crossed by the Project Route

Functional Classification System Category	Project Route
Local Street or Road (Class 0)	66
Interstate (Class 1)	3
Urban or Rural Principal Arterial (Class 2 & 3)	10
Urban Minor Arterial or Collector (Class 5 & 6)	37
Total	**116**

The annual average daily traffic of each roadway impacted by the Project has not been determined. Generally, the traffic volumes from highest to lowest along the four classification categories, as follows:

- Interstate (Class 1),
- Urban or Rural Principal Arterial (Class 2 & 3),
- Urban Minor Arterial or Collector (Class 5 & 6) and
- Local Street or Road (Class 0).

Traffic data is available along select roadways where MassDOT count stations are provided. Based on the data available for state-owned roadways impacted by the Project, traffic volumes along these roadways range from approximately 5,000 to 110,000 vehicles per day. Interstate 90 (Massachusetts Turnpike) is the highest-volume roadway impacted by the Project and falls under the highest volume classification.

Construction of the Project along the Project Route will not result in a significant increase in traffic or material impacts to existing traffic patterns. During construction, the main impacts will occur when stringing transmission conductors over road crossings and at ROW construction access locations. At the ROW access locations, construction equipment and personnel will enter and exit the ROW from public roads and temporarily increase traffic. Since the various construction tasks will occur at different times and locations, traffic at these entry roadways will be intermittent. Generally, the larger construction equipment will enter the ROW once while working in a specific area; however, multiple trips may be conducted when delivering materials such as construction matting, stone, or concrete. Smaller vehicles such as pick-up trucks carrying construction workers will access the ROW daily.

Additional impacts, including lane closures or temporary traffic stops, are anticipated when conductors and shield wire need to be strung over public roadways. At such times, boom trucks may be set up in travel lanes, shoulders, or medians to serve as support to the lines as they are attached to the permanent transmission line structures. In addition, construction equipment may be necessary to install temporary guard structures. Traffic will be stopped for a short period of time to allow a rope to be manually pulled across the roadway. The conductors will then be attached to this rope and pulled above the roadway onto the temporary guard structures; traffic typically will be able to flow while the conductors are attached to the structures. Line stringing will be required along the Project Route across 116 roadway crossings and two railroad crossings. Permits from MassDOT will be required for this work at state highway crossings.

The following MassDOT state highways listed in Table 5-13 will require lane closures or other restrictions, such as shoulder closures, to access utility structures throughout the various phases of construction and/or to string transmission conductors over road crossings:

Table 5-13: Towns and Access to Utility Structures

Town	Access
Shelburne	Main Street (Route 112)
	Mohawk Trail (Route 2)
Deerfield	Interstate 91
	Greenfield Road (Route 5, 10)
Leverett	Long Plain Road (Route 63
Pelham	Daniel Shay Highway (Route 202)
Ware	Belchertown Road (Route 9)
	Gilbertville Road (Route 32)
Spencer	West Main Street (Route 9)
Auburn	Interstate 290
	Southbridge Street (Route 12)
	Massachusetts Turnpike
	Washington Street (Route 20)
Millbury	Worcester-Providence Turnpike (Route 146)

The timeline for implementing the lane/shoulder restrictions will be determined based on the construction/outage schedule and through consultation with MassDOT.

Along local roadways, NEP will coordinate with the municipalities on requirements for work hours, signage, and police details.

Additionally, there are eight active railroad crossings within or adjacent to the ROW. NEP will coordinate with respective owners for permitting/permissions to work in these areas.

5.4.11.1 Avoidance, Minimization, and Mitigation

Traffic impacts associated with the Project will be temporary in nature and confined to the amount of time necessary for construction. NEP will carefully coordinate construction to minimize impacts to adjacent residences and businesses and others relying on neighboring transportation corridors.

Prior to beginning construction, NEP will work closely with the municipalities and MassDOT to develop construction TMPs, which include construction-phase traffic controls to minimize the impacts of construction on the traveling public. These plans are developed for each specific location based on guidelines specified by MassDOT and the Manual on Uniform Traffic Control

Devices ("MUTCD"). Components of these plans are reliant on road type, posted speed limit, geometry, daily volumes, and other variables pertaining to the existing conditions and type of proposed work. TMPs for state-owned and maintained highways are submitted to MassDOT as part of a State Highway Access Permit application. Once the TMPs are revised to MassDOT's satisfaction, State Highway Access Permit(s) will be issued allowing the work to be performed per their requirements. TMPs are a function of the MassDOT permitting process and the number of TMPs required for the Project depends on the number of locations where work is proposed in the ROW of a state-owned highway.

Two main types of TMPs are anticipated for this Project, including access plan setups for any delivery/removal of materials and/or personnel to the Project site and crossing set ups for wire pulls. Based on consultations with MassDOT to date, 15 access plans and 15 crossing plans, totaling 30 TMPs, are expected to be developed for this Project. General components of each TMP include:

- Reflective cones or drums to delineate shifts/closure in travel lanes/shoulders.
- Advanced warning signage posted in each travel direction to alert drivers of the upcoming work zone.
- Police officers and/or flaggers positioned as necessary to facilitate traffic flow.
- Portable changeable message signs posted prior to the work zone.
- Truck-mounted attenuators positioned in the travel lane/shoulder as required prior to the work zone.

Additional site-specific TMP components will be included as required. Together, these components minimize the impacts of construction on the traveling public by allowing traffic to flow safely and efficiently through the work zone.

Implementation of a well-designed TMP will reduce the potential for traffic disruptions and inconvenience to drivers. All TMP work must conform to the MUTCD and MassDOT standards. With the implementation of these measures, the temporary traffic disruptions anticipated from the Project will be minimized.

For municipality-owned roadways, NEP and its contractors will coordinate directly with the individual municipalities, often including government and public safety officials, to develop construction work zones, practices and procedures, which may be based on MassDOT and MUTCD design standards.

For the eight railroad crossings, NEP will consult with railroad owners/operators to establish agreed upon practices and procedures for undertaking stringing operations in each location. Requirements may include railroad-specific safety training, timing restrictions, guard structures, and utilizing flagmen and other trained personnel.

5.4.12 Electric and Magnetic Fields

NEP's consultant, Gradient, assessed EMF associated with the Existing and Rebuilt Lines and Taps along the Project Route at annual average and system peak loading conditions. Gradient conducted the EMF modeling at a height of one meter (3.28 feet) above the ground surface. EMF modeling was performed for the existing overhead circuit configuration in the ROW cross sections (referred to in the report as "pre-Project" case) and for two post-Project cases:

1) For the overhead circuit configuration after the E5/F6 Lines have been replaced and current loadings representative of the in-service year operating at 69-kV ("69 kV post-Project case").
2) For a second post-Project case with current loadings for the E5/F6 Lines representative of the in-service year operating at 115-kV ("115 kV post-Project case").

Modeling was conducted for eight representative ROW cross sections. For all but two of the representative cross sections, there are no other circuits within the Project ROW. For representative cross section 1 (as shown in Table 5-14 below) that occurs for the ROW segment entering the Deerfield #4 Substation, the 69 kV D4 line is present in the ROW along with the E5/F6 Lines, and this line was included in the EMF modeling for this cross section to determine the cumulative EMF levels at the ROW edges. For representative cross section 5 that occurs for a ROW segment between the Harrington #2234 Substation and the Meadow Street #552 Substation, the 69 kV T20 line[32] is present in the ROW along with the E5/F6 Lines, and it was included in the EMF modeling for this cross section to determine the cumulative EMF levels at the ROW edges.

EMF modeling was conservatively conducted for the location of lowest conductor sag[33] for each cross section, and for both annual average and system peak load levels. Additional information about Gradient's modeling methods and results are provided in the EMF Modeling Analysis Report in Appendix 5-5. Gradient's results are summarized below.

5.4.12.1 Magnetic Fields

Table 5-14 summarizes magnetic field modeling results for annual average loading conditions.

[32] The T20 circuit is typically open and was thus assumed to carry no current for both the annual average and system peak loading cases included in this EMF modeling assessment. Although it is currently a 69 kV circuit, it was assumed to be energized at 115 kV per NEP's request.

[33] As provided by NEP, a minimum conductor height above ground of 19.4 feet was used for pre-Project modeling of all representative cross sections and a minimum conductor height above ground of 23 feet was used for post-Project modeling of all representative cross sections based on state code clearance requirements associated with 115 kV design. Modeling at the location of lowest conductor sag is conservative because this is the location with the least clearance between the lines and the ground surface and is thus representative of the highest EMF levels that will be found beneath the lines.

Table 5-14: Summary of Modeled Pre-Project and Post-Project Edge-of-ROW Magnetic Fields for the Representative ROW Cross Sections for Annual Average Loading Scenarios

Representative Cross Section	ROW Segment	Magnetic Field (MF)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Cross Section 1 (D-13148-NE sh. 1)	From Deerfield No. 4 Substation	1.1	2.1	2.5	2.9	3.2	4.5
Cross Section 2 (D-13148-NE sh. 2)	From Deerfield 4 to Deerfield 3 Tap	1.1	1.9	2.2	1.1	1.3	1.7
	From Deerfield 3 Tap to Deerfield 2	<1	1.6	2.0	1.7	1.8	2.0
	From Deerfield 2 to Shutesbury	1.3	2.2	2.4	1.3	1.5	1.8
	From Shutesbury to Quabbin Switch Tap	1.6	2.5	2.6	<1	1.1	1.6
	From Quabbin Switch Tap to Ware	<1	<1	1.2	2.2	2.3	2.3
	From Ware to Lashaway	<1	1.4	1.8	1.9	2.1	2.1
	From Lashaway to Harrington St	2.0	2.8	2.7	1.2	1.1	<1
	From Harrington St to Meadow St	1.8	2.6	2.5	1.0	<1	1.0
	From Meadow St to Leicester	<1	1.3	1.8	<1	1.0	1.4
	From Leicester to Pondville	<1	1.3	1.7	<1	1.0	1.4
	From Pondville to Millbury	<1	<1	1.0	<1	<1	1.0

Representative Cross Section	ROW Segment	Magnetic Field (MF)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Cross Section 3 (D-13148-NE sh. 3)	Deerfield 3 Tap	<1	0.9	0.5	<1	<1	<1
Cross Section 4 (D-13148-NE sh. 4)	Quabbin Switch Tap	1.6	4.1	2.4	1.2	3.4	2.0
Cross Section 5 (D-13148-NE sh. 5)	From Harrington St to Meadow St	1.9	2.8	2.7	<1	<1	<1
Cross Section 6 (D-13148-NE sh. 6)	From Deerfield 2 to Shutesbury	2.3	10.3	11.7	2.1	10.6	12.2
Cross Section 7 (D-13148-NE sh. 7)	From Deerfield 2 to Shutesbury	1.4	7.5	8.5	<1	6.4	7.3
Cross Section 8 (D-13148-NE sh. 8)	From Deerfield 2 to Shutesbury	4.0	8.2	9.1	1.3	1.2	1.5
	From Shutesbury to Quabbin Switch Tap	4.4	8.6	9.3	<1	<1	1.3

Note: kV = Kilovolt; mG = Milligauss; ROW = Right-of-Way; Sh. = Sheet.

As shown in Table 5-14, the Project will generally result in small increases to edge-of-ROW magnetic fields ("MF") levels as compared to the pre-Project case that are frequently less than 1 Milligauss ("mG") and that reach a maximum of 10.06 mG. A maximum edge-of-ROW MF level of 12.18 mG was observed for the right (northeast) ROW edge for representative cross section 6 for the post-Project modeling case assuming 115 kV operation of the E5/F6 Lines, and this MF level remains only about 0.6% of the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") health-based guideline of 2,000 mG. Moreover, MF levels continue to drop off rapidly with increasing distance from the ROW edge, reaching a value of 3.26 mG 50 feet from the ROW edge.

Table 5-15 summarizes pre- and post-Project magnetic fields under the system peak loading scenario.

Table 5-15: Summary of Modeled Pre-Project and Post-Project Edge-of-ROW Magnetic Fields for the Representative ROW Cross Sections for System Peak Loading Scenarios

Representative Cross Section	ROW Segment	Magnetic Field (mG)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Cross Section 1 (D-13148-NE sh. 1)	From Deerfield No. 4 Substation	1.8	3.3	3.9	4.1	4.2	2.6
Cross Section 2 (D-13148-NE sh. 2)	From Deerfield 4 to Deerfield 3 Tap	1.8	3.0	3.5	1.5	1.8	2.5
	From Deerfield 3 Tap to Deerfield 2	1.2	2.3	3.1	2.6	2.9	3.2
	From Deerfield 2 to Shutesbury	2.2	3.6	3.9	2.0	2.3	2.8
	From Shutesbury to Quabbin Switch Tap	2.4	3.9	4.0	1.6	2.0	2.6
	From Quabbin Switch Tap to Ware	<1	1.1	2.0	3.5	3.7	3.6
	From Ware to Lashaway	1.2	2.1	2.7	2.2	2.4	2.7
	From Lashaway to Harrington St	2.6	3.8	3.7	1.4	1.2	1.3
	From Harrington St to Meadow St	1.2	2.2	2.7	2.2	2.9	3.0
	From Meadow St to Leicester	1.0	1.7	2.5	1.0	1.2	1.9
	From Leicester to Pondville	1.0	1.7	2.5	1.0	1.2	1.9
	From Pondville to Millbury	<1	<1	1.3	<1	0.6	1.5
Cross Section 3 (D-13148-NE sh. 3)	Deerfield 3 Tap	<1	1.8	1.1	<1	0.6	<1
Cross Section 4 (D-13148-NE sh. 4)	Quabbin Switch Tap	2.3	5.9	3.5	1.7	4.9	2.9
Cross Section 5 (D-13148-NE sh. 5)	From Harrington St to Meadow St	1.3	2.3	3.0	1.5	2.1	2.1
Cross Section 6 (D-13148-NE sh. 6)	From Deerfield 2 to Shutesbury	3.8	16.3	18.4	3.2	16.6	19.1
Cross Section 7 (D-13148-NE sh. 7)	From Deerfield 2 to Shutesbury	2.4	11.9	13.3	1.4	10.0	11.5
Cross Section 8 (D-13148-NE sh. 8)	From Deerfield 2 to Shutesbury	6.4	13.2	14.5	1.9	1.9	2.3
	From Shutesbury to Quabbin Switch Tap	6.8	13.5	14.6	1.6	1.6	2.1

Note: kV = Kilovolt; mG = Milligauss; ROW = Right-of-Way; Sh. = Sheet.

Slightly higher post-Project edge-of ROW MF increases were observed for system peak load levels due to the higher currents typical of this line loading scenario as compared to the modeling for annual average load levels, but edge-of-ROW increases remained small in magnitude and were frequently less than 1-2 mG and <1 mG for the left and right ROW edges, respectively. The highest post-Project edge-of-ROW MF level of 19.08 mG, which was observed for the right (northeast)

ROW edge for representative cross section 6 for the modeling case assuming 115 kV operation of the E5/F6 Lines, remained less than 1% of the ICNIRP health-based guideline of 2,000 mG.

In order to minimize magnetic fields associated with the Rebuilt Lines, NEP has selected conductor arrangements and phasing configurations that promote magnetic field cancellation. Exposure to magnetic fields is further mitigated by the Project's primarily rural setting and the very limited number of residential structures located within 50 feet of the Project ROWs (see Table 5-16).

Table 5-16: Residential Structures Located Within 50 feet of the Project ROW

Town	Line	Residences within 50ft
Auburn	E5/F6 Lines	28
Leicester	E5/F6 Lines	35
Leverett	E5/F6 Lines	1
Millbury	E5/F6 Lines	26
North Brookfield	E5/F6 Lines	3
Pelham	E5/F6 Lines	1
Shelburne	E5/F6 Lines	1
Spencer	E5/F6 Lines	17
Ware	E5/F6 Lines	14
West Brookfield	E5/F6 Lines	7
Total		**133**

In short, Gradient's modeling indicates that the Project will result in minor magnetic field increases along the E5/F6 ROW. The resulting post-Project magnetic field levels are unusually low for a transmission line ROW and are well below both the ICNIRP health-based guidelines of 2,000 mG for allowable public exposure to 60-Hertz ("Hz") MF. Finally, public exposure to magnetic fields is minimized by the generally rural location of the Project.

5.4.12.2 Electric Fields

Table 5-17 summarizes electric field modeling for both annual average and system peak loading scenarios. As shown in Table 5-17, pre-Project and post-Project modeled electric field ("EF") values at the ROW edges are well below the ICNIRP health-based guideline of 4.2 kilovolt per meter ("kV/m") for all modeled cases. Because EFs are not dependent on conductor loading (i.e., current), only negligible differences in EFs were obtained for annual average and system peak load levels for the post-Project 69 kV operation of the two circuits due to small differences in voltages of the E5 and F6 circuits that were provided by National Grid for the two-line loading scenarios. Because EFs are dependent on voltage, higher EFs were obtained for the post-Project 115 kV operation of the two circuits as compared to the post-Project 69 kV operation. For the 69 kV modeling cases, our modeling analysis indicates that the Project will frequently result in negligible changes to EFs at the ROW edges that are less than 0.02 kV/m, and a maximum edge-of-ROW increase of 0.50 kV/m. For the 115 kV modeling cases, there are some slightly larger changes in EFs at the ROW edges (ranging from -0.05 kV/m up to 0.86 kV/m), although edge-of-ROW EF levels remain low overall (all <0.9 kV/m).

Table 5-17: Summary of Modeled Pre-Project and Post-Project Edge-of-ROW Electric Field Values for the Representative ROW Cross Sections

Representative Cross Section	ROW Segment	Line Loading Scenario	Electric Field (kV/m)					
			Left Edge-of-ROW			Right Edge-of-ROW		
			Pre-Project	Post-Project (69-kV)	Post-Project (115-kV)	Pre-Project	Post-Project (69-kV)	Post-Project (115-kV)
Cross Section 1 (D-13148-NE sh. 1)	From Deerfield No. 4 Substation	Ann. Avg.	0.01	0.05	0.09	0.61	0.60	0.61
		Sys. Pk.	0.03	0.06	0.09	0.62	0.62	0.63
Cross Section 2 (D-13148-NE sh. 2)	From Deerfield 4 to Deerfield 3 Tap	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Deerfield 3 Tap to Deerfield 2	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Deerfield 2 to Shutesbury	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Shutesbury to Quabbin Switch Tap	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Quabbin Switch Tap to Ware	Ann. Avg.	0.03	0.04	0.07	0.02	0.03	0.06
		Sys. Pk.	0.03	0.04	0.07	0.02	0.03	0.06
	From Ware to Lashaway	Ann. Avg.	0.02	0.04	0.08	0.02	0.04	0.06
		Sys. Pk.	0.02	0.04	0.08	0.03	0.04	0.06
	From Lashaway to Harrington St	Ann. Avg.	0.04	0.05	0.08	0.04	0.05	0.07
		Sys. Pk.	0.03	0.05	0.08	0.04	0.04	0.07
	From Harrington St to Meadow St	Ann. Avg.	0.03	0.05	0.08	0.04	0.04	0.07
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.07
	From Meadow St to Leicester	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Leicester to Pondville	Ann. Avg.	0.03	0.05	0.08	0.03	0.04	0.06
		Sys. Pk.	0.03	0.05	0.08	0.03	0.04	0.06
	From Pondville to Millbury	Ann. Avg.	0.02	0.04	0.08	0.02	0.03	0.06
		Sys. Pk.	0.02	0.04	0.07	0.02	0.03	0.06
Cross Section 3 (D-13148-NE sh. 3)	Deerfield 3 Tap	Ann. Avg.	0.12	0.30	0.50	0.12	0.30	0.50
		Sys. Pk.	0.12	0.30	0.50	0.12	0.30	0.50
Cross Section 4 (D-13148-NE sh. 4)	Quabbin Switch Tap	Ann. Avg.	0.17	0.08	0.13	0.33	0.27	0.44
		Sys. Pk.	0.17	0.08	0.13	0.33	0.26	0.44
Cross Section 5 (D-13148-NE sh. 5)	From Harrington St to Meadow St	Ann. Avg.	0.03	0.07	0.09	0.39	0.39	0.39
		Sys. Pk.	0.01	0.06	0.09	0.39	0.39	0.39
Cross Section 6 (D-13148-NE sh. 6)	From Deerfield 2 to Shutesbury	Ann. Avg.	0.03	0.44	0.73	0.04	0.54	0.90
		Sys. Pk.	0.03	0.44	0.73	0.04	0.53	0.89
Cross Section 7 (D-13148-NE sh. 7)	From Deerfield 2 to Shutesbury	Ann. Avg.	0.03	0.30	0.50	0.02	0.30	0.50
		Sys. Pk.	0.03	0.29	0.49	0.02	0.30	0.49
Cross Section 8 (D-13148-NE sh. 8)	From Deerfield 2 to Shutesbury	Ann. Avg.	0.07	0.36	0.61	0.03	0.03	0.05
		Sys. Pk.	0.07	0.36	0.60	0.03	0.03	0.05
	From Shutesbury to Quabbin Switch Tap	Ann. Avg.	0.07	0.36	0.61	0.03	0.03	0.05
		Sys. Pk.	0.07	0.36	0.60	0.03	0.03	0.05

Notes: Ann. Avg. = Annual Average; kV = Kilovolt; kV/m = Kilovolts per Meter; ROW = Right-of-Way; Sh. = Sheet; Sys. Pk. = System Peak.

5.4.12.3 Substations

The EMF modeling results for the representative overhead transmission line cross sections are informative with respect to EMF levels in the vicinity of substations along the Project Route. This is because it is well-established that the transmission and distribution lines entering and leaving substations are generally a stronger source of EMFs outside the fence lines of substations than the electrical equipment within substations (IEEE, 2014).[34] For substation buswork and other electrical equipment (e.g., transformers, switchgear), conductors are typically arranged in very close proximity to each other, resulting in the rapid decay of EMF levels inside substation fence lines.

Based on the pre-Project and post-Project edge-of-ROW MF for the representative ROW cross sections for annual average load levels and for systemic peak load levels provided in Table 5-14 and 5-15 above (Table 1.1 and Table 1.2 in Appendix 5-5), Tables 5-18 and Table 5-19 below summarize the magnetic field modeling results representative of pre-Project and post-Project MF levels at the ROW edges in the vicinity of substations along the E5/F6 Lines for the annual average and system peak loading scenarios, respectively. In addition, based on the summary of modeled pre-Project and post-Project edge-of-ROW EF values for the representative ROW cross sections provided in Table 1.3 in Appendix 5-5, Tables 5-20 and Table 5-21 below summarize the EF modeling results representative of pre-Project and post-Project EF levels at the ROW edges in the vicinity of substations along the Project Route.

[34] Institute of Electrical and Electronics Engineers, Inc. (IEEE). 2014. "IEEE Guide for the Design, Construction, and Operation of Electric Power Substations for Community Acceptance and Environmental Compatibility." IEEE 1127 - 2013. 50p.

Table 5-18: Summary of Modeled Pre-Project and Post-Project Magnetic Fields Representative of ROW Edges in the Vicinity of Substations Along the Project Route: Annual Average Loading Scenario

Substation	Representative Cross Section	Magnetic Field (mG)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Millbury 305 Substation	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.55	0.70	0.98	0.59	0.57	1.01
Pondville Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.55	0.70	0.98	0.59	0.57	1.01
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.80	1.32	1.74	0.85	0.96	1.35
Leicester Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.80	1.32	1.74	0.85	0.96	1.35
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.81	1.33	1.75	0.86	0.97	1.36
Meadow Street Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.81	1.33	1.75	0.86	0.97	1.36
	Ahead Span: Cross Section 5 (D-13148-NE sh. 5)	1.88	2.79	2.70	0.70	0.68	0.63
Harrington Switchyard Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.76	2.61	2.52	0.97	0.93	0.97
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	1.95	2.84	2.65	1.18	1.10	0.87
Lashaway Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.95	2.84	2.65	1.18	1.10	0.87
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.75	1.38	1.78	1.94	2.14	2.09
Ware Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.75	1.38	1.78	1.94	2.14	2.09
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.56	0.64	1.16	2.16	2.33	2.26
Quabbin Substation	For Tap: Cross Section 4 (D-13148-NE sh. 4)	1.56	4.08	2.43	1.20	3.37	2.01
Deerfield 3 Substation	For Tap: Cross Section 3 (D-13148-NE sh. 3)	0.34	0.87	0.52	0.10	0.29	0.17
Deerfield 4 Substation	For Tap: Cross Section 1 (D-13148-NE sh. 1)	1.07	2.11	2.53	2.86	3.15	4.53

Notes: kV = Kilovolt; mG = Milligauss; ROW = Right-of-Way; sh. = Sheet.

Table 5-19: Summary of Modeled Pre-Project and Post-Project Magnetic Fields Representative of ROW Edges in the Vicinity of Substations Along the Project Route: System Loading Scenario

Substation	Representative Cross Section	Magnetic Field (mG)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Millbury 305 Substation	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.69	0.88	1.34	0.57	0.61	1.45
Pondville Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.69	0.88	1.34	0.57	0.61	1.45
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	1.00	1.73	2.49	0.97	1.19	1.90
Leicester Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.00	1.73	2.49	0.97	1.19	1.90
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	1.00	1.74	2.50	0.98	1.20	1.91
Meadow Street Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.00	1.74	2.50	0.98	1.20	1.91
	Ahead Span: Cross Section 5 (D-13148-NE sh. 5)	1.25	2.34	2.96	1.52	2.09	2.11
Harrington Switchyard Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.15	2.15	2.73	2.21	2.88	2.95
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	2.58	3.77	3.70	1.39	1.16	1.26
Lashaway Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	2.58	3.77	3.70	1.39	1.16	1.26
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	1.18	2.11	2.73	2.19	2.43	2.66
Ware Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	1.18	2.11	2.73	2.19	2.43	2.66
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.82	1.05	1.96	3.46	3.74	3.62
Quabbin Substation	For Tap: Cross Section 4 (D-13148-NE sh. 4)	2.25	5.89	3.52	1.73	4.87	2.91
Deerfield 3 Substation	For Tap: Cross Section 3 (D-13148-NE sh. 3)	0.67	1.75	1.05	0.20	0.58	0.35
Deerfield 4 Substation	For Tap: Cross Section 1 (D-13148-NE sh. 1)	1.75	3.26	3.90	4.14	4.23	2.59

Notes: kV = Kilovolt; mG = Milligauss; ROW = Right-of-Way; sh. = Sheet.

Table 5-20: Summary of Modeled Pre-Project and Post-Project Electric Fields Representative of ROW Edges in the Vicinity of Substations Along the Project Route: Annual Average Loading Scenario

Substation	Representative Cross Section	Electric Field (kV/m)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Millbury 305 Substation	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.02	0.03	0.06
Pondville Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.02	0.03	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
Leicester Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
Meadow Street Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
	Ahead Span: Cross Section 5 (D-13148-NE sh. 5)	0.03	0.07	0.09	0.39	0.39	0.39
Harrington Switchyard Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.04	0.04	0.07
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.04	0.05	0.08	0.04	0.05	0.07
Lashaway Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.04	0.05	0.08	0.04	0.05	0.07
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.02	0.04	0.06
Ware Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.02	0.04	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.04	0.07	0.02	0.03	0.06
Quabbin Substation	For Tap: Cross Section 4 (D-13148-NE sh. 4)	0.17	0.08	0.13	0.33	0.27	0.44
Deerfield 3 Substation	For Tap: Cross Section 3 (D-13148-NE sh. 3)	0.12	0.30	0.50	0.12	0.30	0.50
Deerfield 4 Substation	For Tap: Cross Section 1 (D-13148-NE sh. 1)	0.01	0.05	0.09	0.61	0.60	0.61

Notes: kV = Kilovolt; kV/m = Kilovolts per Meter; ROW = Right-of-Way; sh. = Sheet.

Table 5-21: Summary of Modeled Pre-Project and Post-Project Electric Fields Representative of ROW Edges in the Vicinity of Substations Along the Project Route: System Peak Loading Scenario

Substation	Representative Cross Section	Electric Field (kV/m)					
		Left Edge-of-ROW			Right Edge-of-ROW		
		Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)	Pre-Project	Post-Project (69 kV)	Post-Project (115 kV)
Millbury 305 Substation	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.07	0.02	0.03	0.06
Pondville Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.07	0.02	0.03	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
Leicester Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
Meadow Street Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.06
	Ahead Span: Cross Section 5 (D-13148-NE sh. 5)	0.01	0.06	0.09	0.39	0.39	0.39
Harrington Switchyard Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.03	0.04	0.07
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.04	0.04	0.07
Lashaway Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.05	0.08	0.04	0.04	0.07
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.03	0.04	0.06
Ware Substation	Back Span: Cross Section 2 (D-13148-NE sh. 2)	0.02	0.04	0.08	0.03	0.04	0.06
	Ahead Span: Cross Section 2 (D-13148-NE sh. 2)	0.03	0.04	0.07	0.02	0.03	0.06
Quabbin Substation	For Tap: Cross Section 4 (D-13148-NE sh. 4)	0.17	0.08	0.13	0.33	0.26	0.44
Deerfield 3 Substation	For Tap: Cross Section 3 (D-13148-NE sh. 3)	0.12	0.30	0.50	0.12	0.30	0.50
Deerfield 4 Substation	For Tap: Cross Section 1 (D-13148-NE sh. 1)	0.03	0.06	0.09	0.62	0.62	0.63

Notes: kV = Kilovolt; kV/m = Kilovolts per Meter; ROW = Right-of-Way; sh. = Sheet.

5.4.12.4 Conclusion

Gradient's EMF modeling analysis demonstrated that all model-predicted, post-Project MF levels for the representative cross sections, including for both annual average and system peak load levels, are well below the ICNIRP health-based guideline for allowable public exposure to 60 Hz MF (2,000 mG; ICNIRP, 2010). Due in part to the higher post-Project load levels for both the E5 and F6 Lines, for the 115 kV operation case, the Project will generally result in small increases to edge-of-ROW MF levels for the representative cross sections (frequently less than 1 mG and less than 1-2 mG for annual average and system peak load levels, respectively). The EMF modeling analysis also showed that, for the representative cross sections, all model-predicted, post-Project edge-of-ROW EF levels are well below the ICNIRP health-based guideline for allowable public exposure to 60-Hz EF (4.2 kV/m; ICNIRP, 2010). The modeling analysis indicates that the Project will result in only small changes to EFs at the ROW edges across the modeling results (i.e., all edge-of-ROW EF changes were less than 0.5 kV/m and less than 0.9 kV/m for the post- Project 69 kV and 115 kV operating cases, respectively). Modeled EMF levels are both far below relevant health-based standards.

5.4.13 Climate Change Considerations

This Project is part of NEP's efforts to ensure the long-term longevity and reliability of the region's electrical infrastructure in the face of growing demand for electricity and the changing climate. The Project will result in a more climate-ready and resilient transmission system that can withstand more extreme weather events; address existing system capacity shortages and increased demand; and support future interconnection of renewable energy projects.

The increased capacity of the Rebuilt Lines and Taps will support higher volumes of currently active and forecasted renewable energy resources in this region. This longer-term view aligns with the State Hazard Mitigation & Climate Adaptation Plan, which projects electricity consumption during summer may triple, as well as results of the ISO-NE 2050 Transmission Study, which point to a long-term need for additional capacity across the New England transmission system to support long term electric load growth driven by regional commitments for renewable and clean energy, greenhouse gas ("GHG") reduction, and net-zero carbon policies.

NEP consulted the Resilient MA Action Team Climate Resilience Design Standards Tool ("the Tool") for the Project. The Tool assigns climate risks based on three variables: sea level rise and storm surge, extreme precipitation including urban flooding and riverine flooding, and extreme heat. According to the preliminary analysis, the Project Route is at high risk from extreme/moderate precipitation and extreme heat. It is not exposed to sea level rise/storm surge. The Rebuilt Lines and Taps will be made more resilient through installation of concrete caisson foundations, steel structures, and state of the art conductors that respond well to corrosion and operate at higher maximum operating temperatures. Further, the Project's engineering design used structure loading criteria required by the NESC, 220 CMR 125, and National Grid Design Loads for Overhead Transmission Structures. The NESC load criteria require consideration of combined ice and wind district loading, extreme wind conditions, and extreme ice with concurrent wind conditions. Local compensatory flood storage will be provided in accordance with local and state regulations for any proposed fill in Bordering Land Subject to Flooding ("BLSF").

Together, the Rebuilt Lines and Taps contribute to regional climate resilience by providing capacity to meet the region's growing energy demand, reducing the frequency of outages, and incorporating provisions such as enhanced ROW access and modernized transmission line switches, which should reduce response times, shortening the duration of outages when they do occur.

5.4.14 Environmental Justice Considerations

This section reviews the Company's efforts to identify and engage with EJ populations within the Project's designated geographic area ("DGA"), along with the potential impacts to these EJ communities. The Project has a DGA of a one-mile radius of the Project Route. EJ communities within the one-mile radius of the Project are depicted in the Map Book under Environmental

Justice Maps in Appendix 5-1. NEP is developing and implementing this Project consistent with the Commonwealth's environmental and resource use laws and policies, including enhancing opportunities for public involvement. NEP aims to promote a robust transmission system and to properly plan for and address the Commonwealth's energy needs in an efficient and timely way. NEP has taken proactive steps to enhance community involvement and engagement during the planning of the Project.

As part of its stakeholder outreach plan, NEP has promoted and will continue to promote public involvement by the EJ populations located within one mile of the Project Route through the use and dissemination of Project fact sheets, website content, and meeting invitations. No populations within the DGA are classed as being linguistically isolated. Therefore, Project information is being provided in English, with an opportunity to request translations, as necessary. Based on review of the Massachusetts EJ Populations Mapping Tool, there are 19 EJ populations within one mile of the Project, distributed in 13 municipalities, as described in Table 5-22 (below). Of these populations, only four overlap or are within proximity of the ROWs (shaded in blue and bolded in the table below). Out of the 67 miles of Project ROW, only 4.6 miles ROW are within an EJ population. Table 5-22 lists the EJ populations in the vicinity of the Project Route.

Table 5-22: Environmental Justice Populations within One Mile of the Project Route[35]

Municipality	Block Group, Census Tract, County
Amherst	Block Group 1, Census Tract 8203, Hampshire County
Amherst	Block Group 1, Census Tract 8207, Hampshire County
Auburn	Block Group 3, Census Tract 7365, Worcester County
Buckland	Block Group 3, Census Tract 415.02, Franklin County
Charlemont	Block Group 4, Census Tract 401, Franklin County
Hardwick	Block Group 2, Census Tract 7231, Worcester County
Leicester	**Block Group 3, Census Tract 7352, Worcester County**
Millbury	**Block Group 2, Census Tract 7372, Worcester County**
Millbury	Block Group 1, Census Tract 7372, Worcester County
North Brookfield	Block Group 3, Census Tract 7251, Worcester County
Shelburne	**Block Group 4, Census Tract 415.02, Franklin County**
Spencer	Block Group 3, Census Tract 7262, Worcester County
Spencer	Block Group 4, Census Tract 7262, Worcester County
Sunderland	Block Group 2, Census Tract 408, Franklin County
Sunderland	Block Group 3, Census Tract 408, Franklin County
Sunderland	**Block Group 4, Census Tract 408, Franklin County**
Ware	Block Group 2, Census Tract 8201.02, Hampshire County
Ware	Block Group 3, Census Tract 8201.02, Hampshire County
West Brookfield	Block Group 3, Census Tract 7241, Worcester County

The Project is predominantly proposed within the existing ROW, thereby minimizing adverse environmental impacts. Due to the nature of the Project, outage constraints in the region, and NEP's efforts to reduce impacts to the natural and human environment, Project activities will be

[35] Table contains revised block groups since the filing of the EENF based on the updated Massachusetts 2020 Environmental Justice Population Interactive Map (Updated November 2022). https://mass-eoeea.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212

sequenced. No long-term impacts to soil, bedrock, vegetation, surface water, groundwater, wetland resources, or air quality will occur. Construction-period activities, such as grading, road building, vehicle travel, and other earth-disturbing work may result in a temporary increase in airborne dust. Fugitive dust is generated during demolition, construction, and site preparation activities, such as the movement of vehicles, stockpiling of soil, and construction traffic, and placement of construction matting in the site. Impacts to air quality will be minimized by managing the control of dust movement with practices such as spreading wood mulch or straw and using water trucks to spray dried soil to keep it moist. The potential for dust generation is only anticipated during the construction period. Post construction, soil will be stabilized and re-vegetated.

NEP will be implementing measures to avoid, minimize, and mitigate potential environmental impacts throughout the entire Lines, including where it crosses through or is within one mile of mapped EJ populations. These include, but are not limited to, use of construction matting in wetlands to reduce soil disturbance and protect water quality, as well as implementation of the SWPPP to avoid impacts to receiving waters from sediment laden stormwater runoff or from spills or other inadvertent releases of fuels, oils, or other hazardous materials used in equipment or as incidental use during construction.

Because the nature and severity of Project impacts are minimal on all populations, including EJ populations, the Project will not materially exacerbate any existing unfair or inequitable environmental or public health burden impacting the EJ population. Overall, the Project will improve transmission system infrastructure and comply with comprehensive regional plans for maintaining electric transmission reliability in New England, for EJ and non-EJ populations alike.

The Company will continue outreach to EJ community members during the permitting and development phases of the Project to support participation by the EJ community.

5.4.15 Conclusion – Environmental Impacts

The preceding sections have reviewed the environmental and community impacts associated with the Project, including those related to land use, protected land and open space, historical/archeological sites, tree removal, wetlands and water crossings, rare species habitat, public water supplies, visual, noise, traffic, and EMF. In addition, these sections have addressed climate change considerations and the potential for impacts to EJ populations. Since the Project Route is aligned along the existing E5/F6 Line and Tap ROWs, which have been operated and maintained by NEP for decades, permanent impacts to abutters and communities have been minimized. Construction related impacts will be mitigated through use of BMPs, which will be designed and implemented in compliance with federal, state, and local rules and regulations.

5.5 Project Cost

INEP estimates that the total cost of rebuilding the Existing Lines and Taps is approximately $896.9 million. This estimate is provided with an assumed accuracy level of –25%/+50%.

5.6 Conclusion

The Project will provide a reliable and resilient energy supply for the Commonwealth with minimum impact on the environment at the lowest possible cost. Therefore, NEP concludes that, consistent with the Siting Board’s statutory mandate, the construction of the Project along the

Project Route properly minimizes environmental impacts and achieves an appropriate balance among conflicting environmental concerns, as well as among environmental impacts, cost, and reliability.

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