I. Construction Procedures and Methods

The Project facilities would be constructed in accordance with established electric utility practices, best management practices, final engineering plans, Eversource’s specifications and the conditions specified in certificates and permits obtained for the Project. The following subsections describe the land requirements for the development of the Project and the procedures that would be used to construct the Project facilities. During actual construction, certain work activities and sequences may vary, based on factors such as site-specific conditions, final Project designs, and the requirements of regulatory approvals.

I.1 Substation Construction Procedures

Construction of these facilities would involve a similar sequence of activities, as summarized later in this Section. The order of specific activities and methods of construction may vary based on the specific characteristics of each site and the final detail engineering design for each station.

I.1.1 Land Requirements

The new Substation would be developed within the confines of the 0.81-acre, Eversource-controlled Site at 290 Railroad Avenue. Modifications to the existing Cos Cob Substation would be performed on Eversource-owned property and adjoining property.

The Site is of sufficient size and shape to accommodate the new Substation using GIS technology and is free of encumbrances that might otherwise hinder its development. The Site also has direct access from two local roads, which facilitates construction. Upon completion, access would be limited to one point of entry from Field Point Road.

The proposed modifications to Cos Cob Substation require the expansion of the existing fenced area of the facility.
I.1.2 Substation Construction Sequence

I.1.2.1 Site Preparation

Pre-construction work at the new Greenwich Substation and Cos Cob Substation may include, as necessary:

- Installing temporary E&S controls (e.g., silt fence, straw bales). Such controls would be maintained, inspected and replaced as necessary throughout the construction process.
- Removal of the existing building at 290 Railroad Avenue.
- Grading and drainage improvements.

I.1.2.2 Foundation Construction

Foundation construction would commence after the completion of rough grading. The foundation installation would involve excavation, form work, steel reinforcement, and concrete placement. Excavated material would either be reused on-site or disposed of off-site in accordance with applicable requirements.

I.1.2.3 Installation of Equipment

After the foundations are installed, construction activities would shift to the erection of steel-support structures for electrical equipment, such as insulators, bus work, and disconnect switches. In addition, control and power conduits and ground-grid conductors would be installed.

At the new Greenwich Substation, the 115-kV equipment would be housed in a new building. The equipment would be of GIS type which is more compact than a typical air insulated substation. Transmission relay and control equipment will also be contained within the GIS building. Three (3) 115- to 13.2-kV transformers would be installed immediately behind the building with partitioning walls separating each unit. Bus work and switching equipment would be erected on the 115-kV side of each transformer and a distribution switchgear building that houses the 13.2-kV breakers, feeder breakers and
protection and control equipment. There would also be auxiliary equipment installed adjacent to the switchgear.

 Relay and control equipment would be installed within Cos Cob Substation’s existing protective relay and control enclosures.

I.1.2.4 Testing and Interconnections

All of the substation equipment would be tested prior to final connection to the transmission grid. New termination structures and associated conductors and wires would be installed to connect the new transmission line terminals at the existing Cos Cob Substation to the new 115-kV underground transmission facilities.

I.1.2.5 Final Cleanup, Site Security and Restoration

After the facilities at each substation are installed, any remaining construction debris would be collected and properly disposed. Temporary E&S controls would be maintained until soils disturbed by construction activities are stabilized.

Temporary construction security fencing would be replaced with permanent, wrought iron-style fencing at Greenwich Substation. At Cos Cob Substation, Eversource would restore newly disturbed areas substantially to their prior condition. New fencing would be added on the south side of Cos Cob Substation to enclose the expanded area.

I.2 Underground Transmission Line Construction Procedures

The Project’s underground 115-kV transmission line cables would be enclosed in pipes and buried in a common trench, along with a fluid return pipe for circulation and conduits for communication and temperature monitoring. Concrete splice vaults will be required for splicing together the cable sections and for pulling in the transmission supply line cables through the pipes. Splice vaults are typically buried at intervals of approximately 2,000 to 2,800 feet depending upon cable construction and route characteristics. Illustrations of typical trench cross-section and splice vault are included in Section H.

I.2.1 Land Requirements

Eversource proposes installing the underground transmission supply lines principally within or adjacent to public roads within the Town. The exact location of the lines and
the splice vaults within and adjacent to such roads would be determined based on final engineering designs, taking into consideration the constraints posed by existing buried utilities and the location of other physical features.

Eversource is negotiating with representatives from the MNRR and ConnDOT to obtain rights to install segments of the Project beneath the railroad infrastructure and I-95, respectively. Depending on the final route, Eversource may also need to acquire rights from public and private parties to accommodate portions of the Project.

I.2.1.1 Trench Requirements for Off-Road Construction

For construction other than within public roads, the transmission supply lines would require a dedicated area and permanent easement for the location of the lines and/or splice vaults, and for future access. An additional temporary construction easement will be required for maneuverability of equipment and temporary storage of materials. The size of the temporary construction easement required to accommodate the construction will depend on the design depth of the trench, site-specific topographic conditions and environmental and land-use characteristics.

I.2.1.2 Trench Requirements for In-Road Construction

The installation of the transmission supply lines within a public road usually requires a minimum width of 24 feet to accommodate the excavation of the line trench, equipment, and staging of materials.

Installation of the transmission supply lines within public roads would require coordination with other underground, and potentially overhead, utilities. Prior to the installation of the transmission supply lines, the Project construction methods, including schedule, will be reviewed with the Town, the MNRR and/or ConnDOT for work that will occur within close proximity of Town, the MNRR and/or ConnDOT facilities to address any concerns.

I.2.1.3 Splice Vaults

The outside dimensions of pre-fabricated splice vaults for 115-kV HPFF lines are approximately 9 feet wide by 9 feet high and up to 20 feet long. The installation of each splice vault requires an excavation area approximately 12 feet wide, 12 feet deep, and
24 feet long. The top of the splice vault is installed a minimum of 3 feet below grade with two access holes or "chimneys" requiring manhole covers, each approximately 38 inches in diameter. The actual burial depth of each vault will vary, based on site-specific topographic conditions and on the depth of the pipe sections that must interconnect within the vault (the depth of the lines at any location would be based on factors such as the avoidance of other buried utilities).

Vaults may be installed within public ROWs or, in order to avoid conflicts with other buried utilities, may be installed in suitable locations adjacent to such roads (e.g., beneath parking lots, sidewalks, road shoulders, or road medians). However, the location of vaults off-road complicates construction due to the need to cross other buried utilities twice (going into and out of the splice vault).

Splice vaults located outside of the public ROWs would require a permanent easement, and an additional temporary easement for construction activities. Within the easements for the off-road splice vaults, most uses such as the development of structures and growth of trees would be prohibited to avoid damage and impacts to the operation of the lines.

I.2.1.4 Construction Support Areas

During construction, areas for temporarily storing and staging construction materials and equipment would be required in the vicinity of the transmission line route. To the extent possible, these construction support areas would be located on previously disturbed property (e.g., Eversource property, existing parking lots and other commercial properties, or properties formerly used for other types of construction staging, such as highway work). Landowner permission and regulatory approvals (as appropriate) would be obtained for the temporary use of such sites.

Eversource would establish one or more primary construction support areas near the Project area. These areas are used to store construction equipment, materials (including the conduits and splice vaults), and supplies, as well as to park contractor vehicles and parking for personal vehicles. Materials may also be assembled in the yards before they are delivered to work sites. After the completion of construction, the yard sites would be vacated with restoration according to the individual agreement with the landowner and the extent to which the support activities altered the site.
Smaller staging areas would be established next to active construction work sites, such as within or adjacent to roads (e.g., within paved travel lanes, on road shoulders, on road medians, or in parking lots), and would be used temporarily to park equipment, sanitary facilities, and store limited amounts of materials needed for line system installation (e.g., trench boxes, backfill material). Material deliveries would be more frequent in areas where less storage space is available.

As construction progresses along the line route, temporary support sites would be moved to keep equipment and materials near active work locations. Once a temporary construction support area is no longer needed, it would be restored substantially to its previous condition.

I.2.2 Underground Transmission Line Construction Sequence and Methods

The Project construction is expected to be completed over a 12 to 18 month period. However, the transmission supply line construction would be divided into multiple components so that the actual work at any one location would be periodic and would involve various discrete tasks performed in the area at different times. Such multiple mobilizations to an area cannot be avoided due to the sequential nature of the underground line installation work. However, the transmission supply line installation would involve parallel activities and multiple construction crews which would be deployed at the same time to perform construction activities at various locations along the line route.

For example, trenching and trench installation may be performed at various locations along the line route concurrently, using separate crews. At the same time, other crews may be dedicated to the installation of splice vaults. The time required for both trenching and splice vault installation is based on factors such as subsurface conditions (e.g., the presence of rock or groundwater) that dictate the use of special construction procedures, the depth at which the vaults or trenches must be installed, and conflicts with existing utilities that may need to be relocated. The activities involved in the line system construction are further described below.
I.2.2.1 Final Design and Pre-Construction Planning

Prior to the start of construction, Eversource would undertake location-specific studies and surveys and other activities which would include, but not be limited to:

- Conducting surveys to identify existing underground and overhead infrastructure and developing plans for the temporary or permanent relocation, if required, of facilities such as electric, gas, water, sewer, telecommunication facilities, utility poles, traffic signals, hydrants, and bus stops;
- Conducting analyses of soil and groundwater conditions along the line route and preparing plans for soil and groundwater handling during construction; and
- Identifying locations of construction storage yards and construction support areas and obtaining approvals for using such areas. Eversource would continue to consult or coordinate with the Town, as needed.

I.2.2.2 Construction Process

The first step in the construction process would be to deploy appropriate E&S controls (e.g., catch basin protection, silt fence or straw bales, as necessary) at locations where pavement or soils would be disturbed. Within roads and other paved areas, the pavement then would be saw cut and removed.

To install the pipe, a trench would be excavated approximately 6 to 10 feet deep and approximately 5 feet wide (for trench depths requiring shoring to stabilize the sidewalls). Excavated material (e.g., pavement, subsoil) would be placed directly into dump trucks and hauled away to a suitable disposal site or a temporary storage site for screening/testing prior to final disposal, or re-used in the excavations for backfill. If groundwater is encountered, dewatering would be performed in accordance with authorizations from applicable regulatory agencies and may involve discharge to catch basins, temporary settling basins, temporary holding tanks (frac tanks), or vacuum trucks.

For the transmission supply lines, the pipes and conduits would be installed in sections. The steel pipes will be delivered in approximately 40-foot lengths and welded together in the field, while the PVC conduits would be delivered in sections between 10 to 20 feet.
long and joined by swabbing the bell and spigot with glue and then pushing the sections together. After installation in the trench, the pipes and conduits would be encased in a low strength thermal concrete. The trench would then be backfilled with material with sufficient thermal characteristics to help dissipate the heat generated by the lines (thermally approved clean excavated material, thermal sand and/or a FTB).

Trenching, pipe installation, and backfilling would proceed progressively along the route such that relatively short sections of trench (typically 200 feet per crew) would be open at any given time and location. Work zones around the trench area usually range from approximately 600 to 800 feet. During non-work hours, temporary cover (steel plates) would be installed over the open trench within paved roads to maintain traffic flow over the work area. After backfilling, the trench area would be repaved using a temporary asphalt patch or equivalent. Disturbed areas would be permanently repaved as part of final restoration.

At intervals of approximately 2,000 to 2,800 feet along the line route, pre-cast concrete splice vaults would be installed below ground. The length of an underground line section between splice vaults (and therefore the location of the splice vaults) is determined based on engineering requirements (such as the maximum allowable cable pulling tensions; maximum allowable cable sidewall pressure; and, cable weight/length that can fit on a reel and be safely shipped) as well as land constraints. The specific locations of splice vaults would be determined during final engineering design.

For safety purposes, the splice vault excavation would be shored and fenced. Vault sites also may be demarcated by concrete (Jersey) barriers. Vault installation within roadways may require the closure of travel lanes in the immediate vicinity of the vault construction.

Each vault would have two entry points to the surface (manholes). After backfilling, these entry points would be identifiable as manhole covers, which would be set flush with the ground or road surface.

After the vaults and pipes and conduits are in place, the pipes and conduits would be swabbed and tested (proofed), using an internal inspection device (mandrel), to check for defects that could damage the lines upon pulling or during normal operation. Mandrelling is a testing procedure in which a “pig” (a painted aluminum or wood
A cylindrical object that is slightly smaller in diameter than the pipe or conduit) is pulled through the pipes and conduits. This is done to ensure that the “pig” can pass easily, verifying that the pipes and conduits have not been crushed, damaged, or installed improperly. After successful proofing, the transmission lines and fiber optic cables would be installed and spliced. Cable reels would be delivered by tractor trailers to the vault sites, where the cable would be pulled into the conduit using a truck-mounted winch and cable handling equipment.

To install each transmission line within the pipes, 3 large cable reels would be set up over the splice vault and a winch would be set up at one of the adjacent splice vault locations. The lines would then be pulled into the pipes by winching a pull rope attached to the end of a pulling eye attached to all 3 individual cables. The splice vaults would also be used as pull points for installing the temperature monitoring fiber optic cables under a separate pulling operation. In addition, pull boxes hand holes would be installed near the splice vaults for the pulling and splicing operations required for the communications fiber optic cables.

After the transmission lines are pulled into their respective pipes, the ends would be spliced together in the vaults or terminated inside the substations. Because of the time-consuming precise nature of splicing high-voltage transmission lines, their sensitivity to moisture (moisture is detrimental to their useful life), and the need to maintain a clean working environment, splicing HPFF lines is a complex procedure and requires a controlled atmosphere. A “clean room” atmosphere would be provided by an enclosure or vehicle located over the manhole access points during the splicing process. It is expected to take approximately 14 to 16 days to complete the splicing operation in each splice vault (two 3-phase HPFF115-kV cable splices in each splice vault). During commissioning, access to splice vaults may also be required.