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J. CONSTRUCTION STEPS

The proposed GSRP and MMP would be constructed in accordance with established industry practices, as well as CL&P's specifications. In addition, construction activities would conform to any conditions identified in permits obtained for the GSRP and MMP.

The following subsections describe the general procedures that would be used for the installation of both the overhead (Section J.1) and underground (Section J.2) portions of the transmission line. The proposed configuration of transmission lines along each route segment is depicted on the cross-section drawings in Volume 10 *(Typical Cross Sections and Photo Simulations)*.

J.1 OVERHEAD TRANSMISSION LINE CONSTRUCTION

J.1.1 Overview of Overhead Line Construction

CL&P will construct the GSRP and MMP in several stages, some of which will overlap in time. The following construction activities, materials, and equipment are generally expected to be involved in the construction of the overhead transmission lines on or adjacent to the existing or expanded transmission ROWs:

- Surveys to stake monumented line of corridor, ROW boundaries, and future structure locations.
- Identification and marking of wetland and watercourse areas.
- Identification and marking of cultural resources concerns.
- Identification and marking of sensitive environmental resource areas to be avoided.
- Establishment of field construction areas and preparation of staging and lay-down areas.
- Establish erosion and sediment controls – pickups and other small trucks, or small track vehicle.

- Clear for new access roads or improve existing roads – flatbed truck, brush hog, bulldozer, bucket trucks for canopy trimming, tree shear for larger trees, wood chipper.
- Construction of new access roads or maintain existing roads to provide a travel way of at least 15 to 20 feet in width – bulldozer or front loader, dump trucks for crushed stone or gravel, pickups or stake-body trucks for culverts, wetland mats, mat installer; roads may be wood, gravel, or matted; using culverts or crushed stone for wet areas; roads may be temporary or permanent. Roads must have sufficient width and capacity for heavy construction equipment, both over-the-road and off-road vehicles, including oversize tractor trailers. The need for access for flatbed trailers and concrete trucks often determines the scope of access road improvements. Road grades must be negotiable for over-the-road trucks; 10 percent maximum, and less if wet weather or surface conditions provide traction problems. Vehicles with tracks or tires are used.
- Preparation of staging and laydown areas if they are to be off the ROW. The preparation process and equipment is the same as for access roads unless existing areas are to be used. Establish field office trailer, sanitary facilities and parking areas.
- Preparation of work area at sites of existing and new structures, if necessary, because of slopes or surface conditions. Typically, work at structure sites will be contained within the existing ROW. The same equipment is needed as for access road preparation and staging areas.
- Construction of foundations and erection/assembly of new structures – same equipment and material as for access road preparation with addition of caissons for foundations; flatbed trucks for structure components, auger, excavator, cranes, other trucks for reinforcing rods, concrete trucks for structures requiring concrete pads or foundations, bucket trucks and hardware, conductor reels, and conductor pulling rigs. Dump trucks are needed for the foundation work if excess excavated material has to be removed from the ROW. In wet conditions or if groundwater is encountered during excavation, the water will be pumped from the excavated areas and discharged in accordance with applicable local and state requirements. As with all other

activities, this would require Council approval and would have to comply with any applicable regulation.

- Removal of existing structures – bucket trucks for dismantling existing lines, with reel trailers to haul out old conductors, trucks to haul out old hardware, flatbed truck with crane to remove structures, trucks with hydraulic steel sheers to cut steel supports or components, stake or dump trucks to haul out smaller components.
- Restoration – all debris is hauled off the ROW for disposal; but brush may be piled, scattered, or chipped. In some areas if allowed, disturbed ground is back bladed to its preconstruction contours unless directed otherwise. If the work site is in an agricultural field, the soil can be decompacted by disking. Erosion controls are left in place until vegetation is re-established. Steep areas may be stabilized with jute netting or pre-made erosion control fabric containing seed, mulch, and fertilizer. Access roads where culverts or crushed stone fords were installed will be left in place or removed as directed by the Council. Periodic monitoring and reporting with on-site inspection by the Council is required until it is determined that restoration has been achieved.

J.1.2 Material Staging Sites

A combination of temporary storage areas, staging areas and laydown areas would be necessary to support construction. The typical use of each type of area is described in following sub-sections.

For the transmission facilities, material staging sites would be required at locations in the vicinity of the transmission line corridor. Although the areas do not necessarily have to be adjacent to the transmission line ROW, the closer these areas are to the ROW, the less the disturbance would be to the public. Whenever possible, material storage, staging and laydown areas would be set up on property already owned by CL&P. In order to minimize the impact on the public, if CL&P-owned property is not available in the vicinity of construction, areas such as parking lots or land that is not in use would be considered, as long as the areas are of sufficient size and in the vicinity of construction. The contractor performing construction would be responsible for selecting sites for material staging and would also be responsible for making arrangements with property owners for use of the land during construction.

J.1.2.1 Storage Areas

Storage areas typically range in size from approximately two to five acres. These areas would be used to temporarily store construction materials, equipment, and supplies. Additionally, storage areas would be used for mobile construction offices; for parking of personal vehicles of the construction crews; for parking construction vehicles and equipment; and for performing minor maintenance, if needed, on construction equipment. Components for new structures may be temporarily stored at these locations prior to their delivery to structure sites. Assembly of materials or structures may also occur at these areas prior to their delivery on site. These areas may also be used for temporary storage for structures that have been dismantled prior to their disposal off-site.

Storage areas would typically be selected based on their proximity to the actual work location. As construction of the transmission line progresses, storage areas are typically moved in order to keep equipment and materials nearer to the locations where line construction work is being performed. Once a storage area is no longer used to support construction activities, it would be returned to its preconstruction condition as requested by the property owners.

J.1.2.2 Staging Areas

These sites are generally less than two acres in size. Staging areas would be used for temporarily stockpiling tubular sections of the steel monopoles, materials that comprise the H-frames and associated equipment for overhead line construction. These areas would be located along each of the construction segments of the route. Steel and wood, along with equipment from disassembled structures may be temporarily held at these areas prior to their off-site removal and/or disposal. As construction progresses, staging areas would likely be relocated to coincide with construction work. When a particular staging area is no longer required, the site would be returned to its condition prior to construction as requested by the property owners.

J.1.2.3 Laydown Areas

In general, laydown areas would be located at line-structure sites, within the transmission line ROW and typically within the envelope noted on the *Aerial Photographs – 100 Scale* (Volume 11). Materials and equipment associated with the dismantlement of existing structures or the erection of new structures would be placed at these locations during construction for the new structures. Efforts would be made to minimize the impact on adjacent property owners while this site work occurs. Upon completion of site construction, each laydown area would be appropriately restored as requested by the property owners.

Based on the criteria noted above, a preliminary review of potential storage and staging areas associated with construction support of the Project was conducted. From this review, an inventory of possible sites was prepared and is provided in Table J-1 *(Review of Potential Material Staging Sites)*. The table summarizes, by municipality, locations in the vicinity of the proposed route that have sufficient area for construction support. The actual locations of the sites proposed for use during construction would be dependent upon detailed final engineering, along with input from the contractor responsible for constructing the line.

Table J-1 Review of Potential Material Staging Sites

Town	Area	Type of Site
Bloomfield	North Bloomfield Substation	Storage
Manchester	JC Penney Logistics Support Facility	Storage
Manchester	Manchester Landfill	Staging
South Windsor	United Steel Corneau Way	Storage
Suffield	Mountain Road at Babbs Road	Storage
Suffield	Sheldon Farm (Supply)	Storage
Windsor	1404 Blue Hills Avenue	Storage

J.1.3 Construction Field Office

Field offices provide headquarters for engineering and supervision in the area where work is being performed. These offices would typically be located on existing property owned by CL&P or on the existing transmission line ROW. Efforts would be made to locate field offices within other sites such as storage or substation areas. As construction progresses on the transmission line, field offices may be relocated to stay near the areas of activity. Any temporary disturbance caused by construction field offices would be repaired or returned to its original condition as requested by the property owners.

J.1.4 Temporary Erosion and Sedimentation Controls

Temporary erosion controls (e.g., silt fence, hay/straw bales, filter socks, mulch, temporary and/or permanent reseeding) would be installed as needed, prior to clearing operations in compliance with *2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control*. The placement of such temporary controls would be appropriate to minimize the potential for erosion and sedimentation in areas where soils have been disturbed. Permanent stabilization of disturbed soils may be required as well, particularly in areas where no future construction will occur and wetlands/watercourses are nearby. The need for and extent of temporary or permanent erosion and sedimentation controls would be a function of considerations such as:

- Slope (steepness, potential for erosion, and presence of resources such as wetlands or streams at bottom of slope)
- Type of vegetation removal method used and extent of vegetative cover remaining after clearing (e.g., presence/absence of understory or herbaceous vegetation that would minimize the potential for erosion and degree of soil disturbance as a result of the movements of clearing equipment)
- Type of soil
- Soil moisture regimes
- Schedule of future construction activities
- Proximity of cleared areas to water resources, roads, or other sensitive environmental resources
- Time of year: The types of erosion and sedimentation control methods for a particular area would depend on the time of year. For example, reseeding would not typically be effective during the winter months. In winter, with frozen ground, controls other than re-seeding (such as wood chips, straw and hay, geotextile fabric, waterbars, or crushed stone) would be used to stabilize disturbed areas until seeding can be performed.
- Extreme weather conditions during or immediately following soil disturbance

J.1.5 Vegetation Removal

CL&P is currently maintaining the vegetation along the existing corridors within or adjacent to where the overhead 345-kV transmission line is proposed. Since April 7, 2006, CL&P's ROW vegetation maintenance practices have been required to comply with mandatory standards adopted by the National Electric Reliability Corporation following the August 14, 2003 Northeast blackout, which was found to have been triggered by line outages caused by overgrown vegetation. Such vegetation management is designed to allow the reliable operation of the transmission facilities by preventing the growth of trees or invasive vegetation that would interfere with the transmission facilities or access along the ROW. As a result, the vegetation on the ROW within the maintained portions of the ROW typically consists of shrubs, herbaceous species, and other low-growing species. Presently unused or non-maintained portions of the ROW that are not proximate to the existing line may support taller vegetation.

To accommodate the new 345-kV facilities, vegetation removal will be required. Vegetation along the ROW will only be removed where necessary to allow construction, to provide and maintain access to and, as needed, along the ROW, or to provide safe distances between the conductors/wires and woody vegetation. For much of its length, the entire width of the ROW will not need to be cleared in order to accommodate the new line.

While undesirable tall-growing woody species, within the ROW and proximate to the existing or new lines will be removed, desirable species will be preserved to the extent practical. In selected cases, certain desirable low-growing trees may be kept on the ROW in certain locations and only trimmed to assure adequate clearance from wires and structures pursuant to CL&P's *Right-of-Way Vegetation Initial Clearance Standard for 115-kV and 345-kV Transmission Lines*. Generally, all tall-growing tree species will be removed from the right-of-way and low-growing tree species and taller shrub species will be retained in the areas outside of the conductor zones (the area directly under the conductors extending outward a distance of 15 feet from the outermost conductors).

These activities will modify, but will not eliminate vegetation and wildlife habitat. In general, the principal effect of vegetation clearing along the ROWs will be to forested habitat, which will be removed (where required) and will be replaced over time with native shrubs, forbs and grasses resulting in an old field and brush habitat.

Vegetation removal for construction will be performed using mechanical methods. Appropriate erosion and sediment controls will be deployed as necessary (refer to Section J.1.4).

During and after the 345-kV line construction, off-ROW "danger" trees which could pose hazards to the integrity of the transmission line also will be identified and removed. Danger trees are weak, broken, decaying or infested trees that could cause flashovers or contact the structures or conductors or violate the conductor zones if they were to fall towards the right-of-way.

Where removal of woody vegetation is required, vegetation will be cut flush with the ground surface to the extent possible and treated (herbicide). Where practical, trees will be felled parallel to the ROW to minimize the potential for off-ROW vegetation damage.

To stabilize disturbed sites after the completion of construction, CL&P may seed disturbed areas with appropriate grass-type mixes. Vegetative species compatible with the use of the corridor for transmission line purposes are expected to regenerate naturally, over time. CL&P will promote the re-growth of desirable species by implementing vegetation maintenance practices to control tall-growing tree and undesirable invasive species, thereby enabling native plants to dominate.

CL&P will take particular care to maintain vegetation along streams and within wetlands to the extent possible. In general, CL&P may alter to some degree vegetation management activities in the following areas; provided that the same construction and operation of the facilities is maintained:

- Areas of visual sensitivity where vegetation removal may be limited for aesthetic purposes
- Steep slopes and valleys which are spanned by transmission lines
- Agricultural lands
- Residential areas where maintained landscapes do not interfere with the construction or operation of the facilities.

J.1.6 Access Roads

Continuous access along the existing ROW is generally not required for the 345-kV overhead transmission line, although access is required to each transmission structure location. Because the overhead line would follow existing well-established ROWs, existing access roads are generally already in place and are expected to be used during construction.

Along most of the Connecticut Portion of the North Bloomfield to Agawam 345-kV Line Route and MMP corridor, the ROW has been in existence for over 80 years, and as a result, some access is already available. This existing access typically would be expanded and used for construction access wherever possible. However, it is expected that most of these existing roads will have to be improved or otherwise prepared for construction use. In particular, the access roads must be improved to assure appropriate grades and to be of sufficient width and capacity to safely support heavy construction equipment, such as oversize flat-bed trailers, cranes, and concrete trucks. Typically, grades must be 10 percent or less.

Access road improvements may include clearing of vegetation along the road, and widening roadway travel surfaces as needed to provide a travel surface of typically 15 to 20 feet. Access roads may be graveled and where streams or wetlands must be crossed, culverts and wetland mats may be used or, if already present, improved. Erosion and sedimentation controls will be installed before the commencement of any work on access roads.

CL&P has performed an initial review of existing access roads that lead to the transmission line ROW for the Connecticut Portion of the North Bloomfield to Agawam 345-kV Line Route and for the MMP. Based on this initial review, an inventory of possible access roads was prepared. Tables J-2 and J-3 summarize the public roads and other sites that may provide the access to the transmission line ROW. Included for reference is the corresponding Segment Number from the 400-Scale Aerial Route Maps in Volume 9, which illustrates the location of the roadways with respect to the access roads, transmission lines, substations and transmission line junctions. A detailed evaluation of the access roads required for construction will be conducted and included in the Development & Management (D&M) Plan that will be prepared for the Connecticut Portion of the North Bloomfield to Agawam 345-kV and MMP Line Routes.

Table J-2 Review of Potential Access Roads for Connecticut Portion of The North Bloomfield to Agawam 345-kV Line Route

Town	400-Scale Aerial Route Map	Existing Access to ROW via the following Town/City streets or sites:
Bloomfield	1 of 10	Duncaster Road
Bloomfield	1 of 10	Tariffville Road
Bloomfield	1 of 10	Hartford Ave (Route 189)
East Granby	1 of 10	Tunxis Avenue
East Granby	2/3 of 10	Hatchett Hill Road (Route 540)
East Granby	3 of 10	Adams Drive
East Granby	3 of 10	Holcomb Street
East Granby	4 of 10	Turkey Hills Road (Route 20)
East Granby	6 of 10	Newgate Road
East Granby	6 of 10	Wyncairn Road
Suffield	8 of 10	Phelps Road
Suffield	8 of 10	Mountain Road (Route 168)
Suffield	9 of 10	Stone Street
Suffield	10 of 10	Colson Street
Suffield	10 of 10	Ratley Road

Table J-3 Review of Potential Access Roads for Manchester to Meekville Junction Circuit Separation Project

Town	400-Scale Aerial Route Map	Existing Access to ROW via the following Town/City streets or sites:
Manchester	1 of 3	Olcott Street
Manchester	1 of 3	Thrall Road
Manchester	1 of 3	Middle Turnpike (U.S. Route 6)
Manchester	2 of 3	I-84/I-291 Interchange
Manchester	2 of 3	Tolland Turnpike
Manchester	3 of 3	Chapel Road
Manchester	3 of 3	Burnham Street

J.1.7 Foundation Work

Most excavations for overhead line-structure foundations are expected to be accomplished using mechanical excavators and pneumatic hammers. However, if required, a controlled drilling and blasting plan would be developed by a certified blasting contractor and approved by CL&P, in compliance with state and local regulations. Residents would be contacted in advance of the blasting and pre-blast surveys would be performed as appropriate. The specific locations where blasting would be required would be determined by conducting field studies (borings) at the proposed structure locations. In the unlikely event that there is damage to a property as a result of the blasting, CL&P will compensate the property owner for the actual damage. Fencing or other barricades would be placed around excavations for structures during non-working hours.

J.1.8 Structure Installation

Structures (steel poles and H-frames) would be delivered to their installation locations in sections and assembled and installed with a crane. Insulators and connecting hardware would be installed on most structures at this time.

J.1.9 Conductor Work

The installation of the overhead line conductors and shield wires would require the use of special equipment at pre-determined locations, at intervals of up to 3 miles apart. The wires would be pulled under tension to avoid contacting the ground and other objects. The remaining insulators and hardware would be installed at angle and deadend structures, and the wires would be sagged to the design tension and connected to the hardware in accordance with industry standards and design specifications.

For the overhead line conductor and wire installations, approximately 11 pulling sites for the Connecticut Portion of the North Bloomfield to Agawam 345-kV Line Route and 4 for MMP would be established along the ROW. These sites are typically 50 to 75 feet wide and 100 to 200 feet long, and are usually located in the ROW. The selection of the conductor pulling site would be determined when the final line design is completed.

The selection of conductor pulling sites will be based on accessibility, terrain, angles within the sections where the conductors would be pulled, the locations of deadend structures, the length of conductors to be pulled, puller capacity, and snub structure loads including placement of pullers, tensioners and conductor anchors. Other considerations include the placement of reel stands, pilot line winders, reel winders, and the ability to provide an adequate temporary grounding system. The locations of the puller, tensioners, and other conductor pulling equipment would be in an area that would not overload the structures. Most of the equipment associated with pulling conductors would be set up in the transmission line ROW, thereby minimizing the overall impact of these operations. Steps would be taken to minimize temporary disturbance to adjacent landowners from noise and activity associated with the pulling operation. These sites and others would be finalized and identified in the D&M Plan.

J.1.10 Cleanup and Restoration of ROW

Disturbed ground would be back-bladed to approximate preconstruction contours, unless CL&P is directed otherwise. For work sites in actively used agricultural fields, the soil may be de-compacted by disking or equivalent methods. Erosion controls would be left in place until removal is approved by the Council. Steep areas would be stabilized with jute netting, pre-made erosion control fabric containing seed, mulch, and fertilizer or the equivalent.

Access roads where culverts or crushed stone fords were installed would be left in place or removed as directed by the Council in accordance with other permit conditions.

Periodic monitoring and reporting with on-site inspection by the Council would occur to ensure compliance with all aspects of the siting decision.

J.1.11 Special Procedures: Rock Removal (Blasting), Dewatering, Material Handling

J.1.11.1 Blasting

If blasting is necessary, CL&P would adhere to the following procedures:

- A certified blasting specialist would develop site-specific blasting procedures, taking into account geologic conditions and nearby structures and assuring compliance with State regulations.
- The blasting plan would be provided to the local Fire Marshal for approval. Blasting charges would be designed to loosen only the material that must be removed to provide a stable foundation, and to avoid fracturing other rock.
- CL&P would seek to meet with each property owner in proximity to the blasting to explain where and when the blasting is expected to occur, and why blasting is necessary.

- Pre-blast surveys, to document existing conditions, would be conducted for any property within a specified distance of the area where blasting would occur. This distance would be determined by CL&P's blasting contractor, in consultation with the Fire Marshal and with the CL&P's approval.
- The areas where blasting would occur would be covered with heavy blanketing materials and charges would be sized appropriately.
- Seismographs would measure each blast to confirm that levels are within prescribed limits.
- Excavated material that cannot otherwise be used at the site would be removed and properly disposed of elsewhere.

J.1.11.2 Soils and Groundwater

During the construction of the transmission lines the effective management of soils and groundwater will be a key consideration. As part of the final GSRP and MMP design, CL&P will develop specific plans for characterizing the soils and groundwater (i.e., presence/absence of contaminants) and subsequently for handling and managing such materials. Such plans will be developed based on the results of agency file reviews, pre-construction sampling and analyses along the approved GSRP and MMP routes, and the incorporation of applicable permit requirements. The following summarizes the approach that CL&P expects to apply in developing such plans.

CL&P will follow the guidance issued by the CT DEP for Utility Company Excavation. The CT DEP currently recommends the following procedure to be followed by utilities that encounter contaminated soil during repair or construction activities. This applies to cases where the contaminated soil/waste are encountered on property not owned by the utility, and the contamination was not created by the utility.

The utility may reuse the contaminated soil in the same excavation within the same area of concern without prior approval by CT DEP provided:

- Any condition that would be a significant environmental hazard as defined in Connecticut General Statutes Section 22a-6(u) is reported by the utility and that the location is identified on a map submitted to the CT DEP Remediation Division.
- Any excess contaminated material is disposed in accordance with solid and hazardous waste regulations as appropriate.
- The upper one foot of the excavation is filled with clean fill material or paved.

Any sampling required to determine whether a significant environmental hazard exists or how excess spoils will be disposed will be the responsibility of the contractors performing the excavation.

Pre-Construction Studies

Prior to construction of the GSRP and MMP, CL&P will commission a due-diligence review of existing data regarding the current and historical uses of areas along the ROWs, properties along the ROWs, and nearby off-site sources. The scope of the due-diligence work will comply with Sections 8.1 and 8.2 of the ASTM Standard E1527-05. The objective of the work will be to identify known locations of potential sources of past or current contamination, such as leaking underground storage tanks, sites designated as hazardous by federal or state government, locations of reported spills of oil or hazardous material, etc.

Based on the results of the due-diligence research review, a sampling and analysis plan will be developed to characterize the soils and groundwater along the specific GSRP and MMP line routes. This plan will identify the locations and depths of the samples that will be collected, as well as the analytical tests that will be performed on the samples. The field investigations will be completed in accordance with an In-Situ Soil and Groundwater Characterization Work Plan (Characterization Work Plan) that will be developed subsequent to the completion of the due diligence work. The objective of this Characterization Work Plan will be to obtain in-situ soil and groundwater data for the purpose of obtaining future approval for disposal/reuse of soil and planning/permitting for discharge of water. In-situ characterization data will be collected in the vicinity of sites of environmental concern identified in the due-diligence review and at appropriate intervals along the route to support approval of future soil reuse/disposal activities.

The results of the field investigations will be used to determine where oil and/or hazardous material is present in the soil or groundwater at levels equal to or greater than the applicable reportable concentration values. Iterative sampling and analysis may be completed, as needed, to define the extent of such areas along the ROW. Such investigation will not extend beyond the GSRP or MMP ROW or construction limits.

J.1.11.3 Soils Handling and Management

Locations Where In-Situ Levels Exceed Applicable Reportable Concentrations of Contaminants

A material handling plan will be prepared, as necessary, to notify CT DEP of CL&P's intent to undertake handling of potential impacted soils at various locations along the GSRP and MMP routes, as necessary. The material handling plan would be implemented in areas where excavation of potentially contaminated soils and dewatering of potentially contaminated groundwater may be necessary during construction/installation activities. The material handling plan will define how to properly handle and manage soil and groundwater that is excavated during proposed site activities in order to minimize exposure to the general public and environmental receptors.

Excavated materials to be transported from the site will be loaded directly onto trucks for off-site disposal at an appropriate facility or stockpiled temporarily at a permitted facility before being disposed at a permanent facility. Soil transported from the GSRP and MMP ROWs will be transported under Bill of Lading or a Hazardous Waste Manifest as appropriate. These soils will be disposed of in accordance with the applicable federal, state and local regulations.

Locations Where In-Situ Levels Do Not Exceed Applicable Reportable Concentrations of Contaminants

Construction of portions of the GSRP and MMP will occur in areas where known or observed historical contamination does not exist. In such areas, a material handling plan is not required. A Material Handling Guideline (MHG) will be developed to direct future management and disposal of solid and liquid Excess Materials generated during construction of the GSRP and MMP in these areas.

J.1.11.4 Construction Site Dewatering

Neither the construction nor the operation of the GSRP and MMP is expected to result in adverse effects on groundwater resources or public water supplies. During construction, care will be taken to avoid effects to municipal water lines that may be located within road ROW.

It is possible that groundwater may be encountered during excavations for overhead structure foundations, for cable system installation (if underground route variations are selected) or during subsurface construction activities at the North Bloomfield Substation.

If groundwater is encountered during excavation, the water will be pumped from the excavated areas and discharged in accordance with applicable local and state requirements. Depending on regulatory authorizations, the water may be discharged on-site into appropriate sediment control basin or directly into municipal storm water catch basins; pumped first to a temporary fractionization (frac) tank and then discharged to the municipal storm water system, or pumped into a tanker truck for disposal at appropriate wastewater treatment facilities located outside of the GSRP and MMP area. Residual silt/sediment collected at the bottom of the frac tanks will be disposed off-site at an appropriately designated disposal facility. Proper catch-basin inlet protection will be installed at catch-basin grates to prevent construction-generated soil excavate and debris from entering the existing roadway stormwater system.

J.2 UNDERGROUND TRANSMISSION LINE CONSTRUCTION

J.2.1 Overview of Underground Line Construction

CL&P would follow typical underground transmission cable construction procedures if portions of the 345-kV line are required to be constructed underground (e.g., along one of the underground line route variations).

J.2.2 Sequence of Underground Construction

J.2.2.1 Construction Within Roadways

Underground cable construction procedures within or adjacent to public roadways are summarized as follows:

- The first step in the construction process is to deploy appropriate erosion and sedimentation controls (e.g., catch basin protection, silt fence or straw bales) at locations where pavement or soils will be disturbed. Within roads and other paved areas, the pavement would then be saw cut and removed.
- At approximately 1,600-foot intervals along each circuit cable route, pre-cast concrete splice vaults (one for each circuit) will be installed below ground. Depending on the amount of space, the vaults may be arranged so that two vaults are nested together (dual vaults), side-by-side, or staggered linearly along the route. The length of an underground cable section between splice vaults (and therefore the location of the splice vaults) is determined based on engineering requirements (such as maximum allowable pulling tensions; the cable weight/length that can fit on a reel and be safely shipped, and cross-bonding requirements) and land constraints. The specific locations of splice vaults will be determined during final engineering design and in some areas could be significantly closer than the 1,600-foot interval stated above.

- For safety purposes, the splice vault excavations are shored and fenced. Vault sites also may be demarcated by concrete (Jersey) barriers or equivalent. Vault installation within roadways may require the closure of two travel lanes in the immediate vicinity of the vault construction.
- Each vault will have two entry points to the surface. After backfilling, these entry points are identifiable as manhole covers, and are set flush with the ground or road surface.
- To install the duct bank for the XLPE-insulated cables, a trench 7 to 10 feet deep and approximately 5 feet wide would be excavated within a typical construction area of 40 to 60 feet wide. This trench would typically be stabilized using trench boxes or other type of shoring. Excavated material (e.g., pavement, subsoil) would be placed directly into dump trucks and hauled away to a suitable disposal site or hauled to a temporary storage site for screening/testing prior to final disposal or re-use 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, frac tanks, or vacuum trucks. Since underground cable installation would involve both the excavation of a continuous trench and areas for splice vaults, it is very probable that rock would be encountered. Such rock would have to be removed using mechanical methods, or possibly mechanical methods supplemented by controlled drilling and blasting. Should drilling and controlled blasting be necessary for the underground cable, it would be performed only pursuant to a plan incorporating multiple safeguards that would be subject to specific approval by the Council, and in consultation with local authorities.
- The duct bank system would consist of nine 8-inch PVC conduits for the XLPE-insulated cables; three 2-inch PVC conduits for the ground-continuity conductors; three 2-inch PVC conduits for the fiber optic relaying cables; and three 2-inch conduits for the temperature-sensing fiber optic cables. The conduit is installed in sections, each of which will be about 10 to 20 feet long, and would have a bell and spigot connection. Conduit sections are joined by swabbing the bell and

spigot with glue then pushing the sections together. After installation in the trench, the conduits are encased in high-strength concrete. The duct bank would then be backfilled with a low-strength fluidized thermal backfill (FTB) with sufficient thermal characteristics to dissipate the heat generated by the cable system.

- Trenching, conduit installation, and backfilling would proceed progressively along the route such that relatively short sections of trench (under favorable conditions, typically 200 feet per crew) will be open at any given time and location. During non-work hours, temporary cover (steel plates) will be installed over the open trench within paved roads to maintain traffic flow over the work area. After backfilling, the trench area will be repaved using a temporary asphalt patch or equivalent. Disturbed areas will be permanently repaved as part of final restoration.
- After the vaults and duct bank are in place, the conduits are swabbed and tested (proofed), using an internal inspection device (mandrel) to check for defects. Mandrelling is a testing procedure in which a 'pig' (a painted aluminum or wood cylindrical object that is slightly smaller in diameter than the conduit) is pulled through the conduit. This is done to ensure that the 'pig' can pass easily, verifying that the conduit has not been crushed, damaged, or installed improperly. After successful proofing, the transmission cables and ground continuity conductors will be installed and spliced. Cable reels will be delivered by special tractor trailers to the vaults, where the cable will be pulled into the conduit using a truck-mounted winch and cable handling equipment.
- To install each transmission cable and ground-continuity conductor within the conduits, a large cable reel will be set up over a splice vault, and a winch will be set up at one of the adjacent splice-vault locations. The cables and ground-continuity conductors (during separate mobilizations) will then be pulled into their conduits by winching a pull rope attached to the ends of each cable. The splice vaults will also be used as pull points for installing the temperature-sensing fiber optic cables under a separate pulling operation. In addition, pull boxes will be installed near the splice vaults for the pulling and splicing operations required for the remaining fiber optic cables.

- After the transmission cables and ground-continuity conductors are pulled into their respective conduits, the ends will be spliced together in the vaults. Because of the time-consuming and precise nature of spicing high-voltage transmission cables, the sensitivity of the cables to moisture (moisture is detrimental to the life of the cable), and the need to maintain a clean working environment, splicing XLPE-insulated cables involves a complex procedure and requires a controlled atmosphere. The ‘clean room’ atmosphere will be provided by an enclosure or vehicle that must be located over the manhole access points during the splicing process. It typically takes 10 to 14 days to complete the splices in each vault (three XLPE 345-kV cable splices in each splice vault). Each cable and associated splice will then be stacked vertically and supported on the wall of the splice vault.
- At the ends of the cable routes, terminations are connected to the cables at 345-kV line transition stations where they transition to overhead transmission lines. Further discussion on the transition station facilities can be found in Section J.3.

J.2.2.2 Construction Within the ROW

Underground cable construction procedures within the ROW are summarized as follows:

- The first step in the construction process is to clear and grade continuous access roads along the duct bank route. Access roads will be required to handle all anticipated construction equipment and material deliveries, including concrete trucks, splice vaults, and cable reels. See Table J-2 for list of potential access roads.
- To mitigate soil disturbance and impacts to adjacent properties it will be necessary to deploy appropriate erosion and sedimentation controls (e.g., catch basin protection, silt fence or straw bales).
- At approximately 1,600-foot intervals along each circuit cable route, pre-cast concrete splice vaults (one for each circuit) will be installed below ground. Depending on the amount of space,

the vaults may be arranged so that two vaults are nested together (dual vaults), side-by-side, or staggered linearly along the route. The length of an underground cable section between splice vaults (and therefore the location of the splice vaults) is determined based on engineering requirements (such as maximum allowable pulling tensions; the cable weight/length that can fit on a reel and be safely shipped, and cross-bonding requirements) and land constraints. The specific locations of splice vaults will be determined during final engineering design and in some areas could be significantly closer than the 1,600-foot interval stated above.

- For safety purposes, the splice vault excavations are shored and fenced.
- Each vault will have two entry points to the surface. After backfilling, these entry points are identifiable as manhole covers, and are set flush with the ground.
- To install the duct bank for the XLPE-insulated cables, a trench 7 feet deep and approximately 5 feet wide would be excavated within a typical construction area of 40 to 60 feet wide. This trench would typically be stabilized using trench boxes or other type of shoring. Excavated material (e.g., pavement, subsoil) would be placed directly into dump trucks and hauled away to a suitable disposal site or hauled to a temporary storage site for screening/testing prior to final disposal or re-use 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, frac tanks, or vacuum trucks. Since underground cable installation would involve both the excavation of a continuous trench and areas for splice vaults, it is very probable that rock would be encountered. Such rock would have to be removed using mechanical methods, or possibly mechanical methods supplemented by controlled drilling and blasting. Should drilling and controlled blasting be necessary for the underground cable, it would be performed only pursuant to a plan incorporating multiple safeguards that would be subject to specific approval by the Council, and in consultation with local authorities.

- The duct bank system would consist of nine 8-inch PVC conduits for the XLPE-insulated cables; three 2-inch PVC conduits for the ground-continuity conductors; three 2-inch PVC conduits for the fiber optic relaying cables; and three 2-inch conduits for the temperature-sensing fiber optic cables. The conduit is installed in sections, each of which will be about 10 to 20 feet long, and would have a bell and spigot connection. Conduit sections are joined by swabbing the bell and spigot with glue then pushing the sections together. After installation in the trench, the conduits are encased in high-strength concrete. The duct bank would then be backfilled with a low-strength fluidized thermal backfill (FTB) with sufficient thermal characteristics to dissipate the heat generated by the cable system.
- Trenching, conduit installation, and backfilling would proceed progressively along the route such that relatively short sections of trench (under favorable conditions, typically 200 feet per crew) will be open at any given time and location.
- After the vaults and duct bank are in place, the conduits are swabbed and tested (proofed), using an internal inspection device (mandrel) to check for defects. Mandrelling is a testing procedure in which a ‘pig’ (a painted aluminum or wood cylindrical object that is slightly smaller in diameter than the conduit) is pulled through the conduit. This is done to ensure that the ‘pig’ can pass easily, verifying that the conduit has not been crushed, damaged, or installed improperly. After successful proofing, the transmission cables and ground continuity conductors will be installed and spliced. Cable reels will be delivered by special tractor trailers to the vaults, where the cable will be pulled into the conduit using a truck-mounted winch and cable handling equipment.
- To install each transmission cable and ground-continuity conductor within the conduits, a large cable reel will be set up over a splice vault, and a winch will be set up at one of the adjacent splice-vault locations. The cables and ground-continuity conductors (during separate mobilizations) will then be pulled into their conduits by winching a pull rope attached to the ends of each cable. The splice vaults will also be used as pull points for installing the temperature-

sensing fiber optic cables under a separate pulling operation. In addition, pull boxes will be installed near the splice vaults for the pulling and splicing operations required for the remaining fiber optic cables.

- After the transmission cables and ground-continuity conductors are pulled into their respective conduits, the ends will be spliced together in the vaults. Because of the time-consuming and precise nature of spicing high-voltage transmission cables, the sensitivity of the cables to moisture (moisture is detrimental to the life of the cable), and the need to maintain a clean working environment, splicing XLPE-insulated cables involves a complex procedure and requires a controlled atmosphere. The ‘clean room’ atmosphere will be provided by an enclosure or vehicle that must be located over the manhole access points during the splicing process. It typically takes 10 to 14 days to complete the splices in each vault (three XLPE 345-kV cable splices in each splice vault). Each cable and associated splice will then be stacked vertically and supported on the wall of the splice vault.
- At the ends of the cable routes, terminations are connected to the cables at 345-kV line transition stations where they transition to overhead transmission lines. Further discussion on the transition station facilities can be found in Section J.3.

J.2.3 Temporary Erosion and Sedimentation Controls

Temporary erosion controls (e.g., silt fence, hay/straw bales, filter socks, mulch, temporary and/or permanent reseeding) would be installed as needed in accordance with the *2002 Connecticut Erosion and Sedimentation Guidelines*, at any time during the clearing operations. The placement of such temporary controls would be appropriate to minimize the potential for erosion and sedimentation in areas where soils have been disturbed. Permanent stabilization of disturbed soils may be required as well, particularly in areas where no future construction will occur and wetlands/watercourses are nearby. The need for and extent of temporary or permanent erosion and sedimentation controls would be a function of considerations such as:

- Slope (steepness, potential for erosion, and presence of resources such as wetlands or streams at bottom of slope)
- Type of vegetation removal method used and extent of vegetative cover remaining after clearing (e.g., presence/absence of understory or herbaceous vegetation that would minimize the potential for erosion and degree of soil disturbance as a result of the movements of clearing equipment)
- Type of soil
- Soil moisture regimes
- Schedule of future construction activities
- Proximity of cleared areas to water resources, roads, or other sensitive environmental resources
- Time of year: The types of erosion and sedimentation control methods for a particular area would depend on the time of year. For example, reseeding would not typically be effective during the winter months. In winter, with frozen ground, controls other than re-seeding (such as wood chips, straw and hay, geotextile fabric, waterbars, or crushed stone) would be used to stabilize disturbed areas until seeding can be performed.
- Extreme weather conditions during or immediately following soil disturbance

J.2.4 Vegetation Removal

For underground construction within the roadway, minimum clearing is required. For underground construction within the ROW, vegetation removal to create a typical construction area 40 to 60 feet wide is required. Additional clearing would also be needed for transition stations, splice vaults and staging areas.

J.2.5 Splice-Vault Requirements

The outside dimensions of splice vaults for 345-kV XLPE cables are approximately 10 feet wide by 10 feet deep and up to 32 feet in length (one per each set of XLPE cables). The installation of each splice vault therefore requires an excavation area approximately 14 feet wide, 13 feet deep, and 36 feet long. At approximately 1,600-foot intervals along the cable route, pre-cast splice vaults will be installed below ground. Splice vaults located along but outside of public roadways require a minimum of 12,000 square feet of permanent easement for future access to perform maintenance and repairs. An additional minimum 4,300 square feet of temporary easement would be required during the initial construction phase. The burial depth of each vault would vary, based on site-specific topographic conditions and the cable depth (based on factors such as the avoidance of other buried utilities). Vaults may be installed within public roadways or, in order to avoid conflicts with other utilities buried beneath the roadways, may be installed in other suitable locations adjacent to such roads (e.g., beneath parking lots, sidewalks, road shoulders, or road medians). However, when vaults are installed off-road for this reason, while duct banks are within the road, the duct bank must cross other parallel buried utilities twice for each vault, which greatly complicates the design and construction.

J.2.6 Special Procedures: Rock Removal (Blasting), Dewatering, Material Handling

Since underground cable installation would involve both the excavation of a continuous trench and areas for splice vaults, it is probable that rock would be encountered at some locations. Such rock would have to be removed using mechanical methods, or mechanical methods supplemented by controlled drilling and blasting. If drilling and blasting become necessary for the underground cable, CL&P would adhere to the procedures outlined in section J.1.11.1.

J.3 TRANSITION STATIONS

A 345-kV line transition station is required whenever an underground cable segment of the line connects to an overhead section of the line. Such transition stations typically require a fenced and graded area approximately 2 to 4 acres in size. Within the line transition station would be a terminal structure, pothead stands, potheads and surge arresters, circuit breakers, and a control enclosure. The protective relaying systems and Supervisory Control and Data Acquisition (SCADA) equipment, battery systems, etc. would reside inside the control enclosure. Shunt reactors that resemble large power transformers may also be required in some transition stations.

J.4 CONSTRUCTION PROCEDURE FOR MODIFICATION OF THE NORTH BLOOMFIELD SUBSTATION

J.4.1 Overview of Substation Construction

The modification of the existing substation will involve several phases. The expansion of the 345-kV switchyards at the North Bloomfield Substation will involve an expansion of the existing substation fence line to accommodate the planned facilities but will not require the purchase of additional property.

The following summarizes the sequential approach that will be used to modify the existing substation. The actual sequence of construction activities and methods of construction may vary based on the specific engineering design ultimately developed. Further, it is anticipated that more detailed construction requirements and, as appropriate, environmental mitigation measures specific to the substation may be defined during the Council's review process.

J.4.2 Site Preparation

Site preparation work may include, as necessary:

- Installation of temporary soil erosion and sedimentation controls (e.g., silt fence, straw bales). Such controls will be maintained, as necessary, throughout the construction process.
- Clearing of vegetation from work areas
- Creating temporary access to the sites for heavy construction equipment
- Grading to create a level work area
- Excavation of unsuitable soils
- Installation of fencing
- Typical construction equipment is expected to include bulldozers, backhoes, man-lift vehicles, compressors, trucks (various sizes), large capacity crane (e.g., 100-ton), and flat-bed trailers.

Changes to current grades and drainage are proposed to support expansion at the south end of the North Bloomfield Substation. Changes to grading would include cutting and filling the substation expansion area to provide a level grade for the installation and operation of substation equipment and to contain insulating fluids. Change to drainage pattern would occur where necessary to maintain drainage away from substation equipment. However, care would be taken to retain natural drainage patterns and prevent additional runoff attributable to the new earthwork to the extent possible. Any existing run-off flow patterns from the house lots onto or adjacent to the proposed expansion should be maintained and not altered by the proposed expansion at North Bloomfield Substation.

J.4.3 Foundations and Equipment

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

After the foundations are installed, construction activities will shift to the erection of structures and equipment including:

- Steel Structures
- Transformers
- Bus and Insulators
- Circuit Breakers
- Gas Insulated Line (GIL)
- Switches
- Voltage & Potential Transformers
- Lightning Masts
- Lighting
- Control Enclosure or Expansion of existing Enclosure
- Cable Trench
- Capacitor Banks
- Series Reactors
- Splice Vaults
- Ground Grid
- Arresters
- Conduits and Cables

J.4.4 Testing and Interconnections

All of the substation equipment will be commission-tested prior to final connection to the transmission grid. New structures and associated conductors and wires will be installed, as necessary, to connect the substation to the new 345-kV facilities.

J.4.5 Final Cleanup, Site Security and Landscaping

After the completion of construction, any remaining construction debris will be collected and removed from the site. Temporary erosion controls will be maintained until the disturbed areas are satisfactorily stabilized. The need for landscaping typically will be discussed during the D&M Plan development phase of the siting process. Landscape plans and specifications, if appropriate, typically will be identified as part of the final engineering and design.

J.5 TRAFFIC CONSIDERATION AND HOURS OF OPERATION

Construction traffic would be localized and short term and is not expected to adversely affect local traffic. The well-established public road network in the Project area would afford ready access for construction vehicles and equipment to work sites. The construction-related traffic increase will be small relative to total traffic volume on public roads in the area. In addition, the construction traffic will be intermittent, temporary and will end once the GSRP and MMP are completed. The addition of this traffic for the duration of these projects is not expected to result in any additional congestion or change in operating conditions along the roadways adjacent to the ROW.

Traffic entering and exiting the ROW from public roadways will increase during the construction phase of the GSRP and MMP. CL&P would develop an access plan for the contractors, along with applicable traffic control plans, to safely navigate construction vehicles onto and off of the ROW with as minimal disruption to traffic along the public way as possible.

Existing access to the North Bloomfield Substation is made via Hoskins Road/Tariffville Road. Post-construction site conditions would not significantly affect existing traffic patterns. Construction is expected to occur during normal work hours, but is also dependent on the scheduling of allowable line outages.