ATTACHMENT N

Revised Environmental Impact Assessment

CHAMPLAIN HUDSON POWER EXPRESS PROJECT

ENVIRONMENTAL IMPACTS ASSOCIATED WITH ROUTING PROPOSED IN JOINT PROPOSAL

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INTRODUCTION

In March of 2010, Champlain Hudson Power Express, Inc. and CHPE Properties, Inc. (collectively the "Applicants") submitted an "Application for a Certificate of Environmental Compatibility and Public Need" ("Application") for the Champlain Hudson Power Express High Voltage Direct Current Transmission System (the "HVDC Transmission System"). The HVDC Transmission System includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending to New York City. The HVDC cables were proposed to be buried within Lake Champlain, the Hudson River, the Harlem River, and the East River. The Application's proposed overland routing consisted of almost three miles of routing around locks in the Champlain Canal, an approximately 70 mile bypass of the Upper Hudson River Polychlorinated Biphenyl ("PCB") Dredging Project, a five-acre converter station site at the City of Yonkers, and a 0.5 acre transformer substation adjacent to the Sherman Creek substation in Manhattan. In July and August of 2010, the Applicants submitted the "Supplement to the Article VII Application of the CHPEI" and additional materials ("Supplement"). In these documents, the Facility route was reconfigured so as to add an additional almost twenty miles of routing within the Canadian Pacific Railroad ("CP") right-of-way ("ROW") in Washington County to bypass the Champlain Canal, and eliminated the Manhattan transformer substation in favor of increasing the in-water segment and added a short (less than 0.5 miles) overland segment to connect to a substation owned or to be owned by the New York Power Authority ("NYPA") near the former site of the Charles Poletti Power Project in Astoria in the borough of Queens, New York City. The segment of the routing within Long Island Sound was also eliminated, as the HVDC Transmission System no longer connects to Bridgeport, Connecticut.

Settlement discussions conducted under guidelines set by the New York State Public Service Commission ("NYSPSC") have proposed a revised routing design (Figure 1-1). The reconfiguration primarily involves moving the Facility route so as to have a lesser degree of in-water placement within Lake Champlain and the Hudson River. The Facility route would now exit Lake Champlain in Dresden, New York and follow the Route 22 ROW for approximately 10.8 miles before connecting to the CP railroad in Whitehall, New York. Rather than enter the Hudson River in the Town of Coeymans, New York, the Facility route would continue south along the CSX ROW through the Town of New Baltimore, Town of Coxsackie, Village of Coxsackie, Town of Athens, Town of Catskill, and Village of Catskill. The Facility route would exit the CSX ROW at approximate mile 227.5 and travel east for less than a mile before entering the Hudson River. The Facility route would include an approximately 7.7 mile bypass of Haverstraw Bay through the Town of Stony Point, Town and Village of Haverstraw, and the Town of Clarkstown.

After entering the Hudson River south of Haverstraw Bay, the cables travel approximately 20.7 miles before entering Spuyten Duyvill and the Harlem River. After 6.58 miles within the Harlem River, the cables exit the water and enter a CSX ROW in the Bronx, then travel under the East River to connect with the Luyster Creek converter station site. This end-point converter station is proposed to be located adjacent to the interconnection point substation at Astoria, Queens, thereby significantly reducing the length of high-voltage alternating current ("HVAC") cable required.

In addition, Certificate Holders would construct an approximately three mile three-phase 345 kV HVAC cable circuit running from NYPA's substation at Astoria to the 345 kV Rainey Substation owned by the Consolidated Edison Company of New York, Inc. (the "Astoria-Rainey Cable", and collectively with the HVDC Transmission System, the "Facility"). The intent of this document is to provide an analysis of the anticipated environmental impacts associated with the overall routing reconfiguration.

1.0 CONSTRUCTION AND OPERATIONAL PROCEDURES

1.1 Construction Methods

Given the length of the route from the Canadian border to New York City (approximately 335 miles) and the diversity of landforms and water areas that are crossed by the Facility route, a variety of construction methods and equipment will be employed. The goal of the cable installation will be to construct a high-voltage direct current ("HVDC") cable system that, once properly installed and commissioned, will minimize the need for extensive maintenance and repair work during the operational life of the system. Analysis of existing buried electric cable projects indicates that the vast majority of failures occur from external causes, not from manufacturing defects within the cable itself. Avoidance of damage from external causes will be accomplished primarily by burying the cable to suitable depths within each segment. External damage on land is usually caused by third parties who excavate near or over the buried cables without verification of location. For submarine cables, external damage is primarily caused by fishing trawls or ship anchors. Besides burial to an appropriate depth, other means of protection that are likely to be employed along the cable route are placement of stone rip-rap, articulated concrete mats, or armored conduit installation. Cable protection measures will vary along the cable route and will be designed on a site-specific basis as part of the Environmental Management & Construction Plan ("EM&CP").

1.1.1 Overland Installation Methodology

For the overland portions of the Facility route, the cables will be buried via excavated trenches or trenchless technology (e.g., Horizontal Directional Drilling ("HDD") or Jack and Bore (J&B)) methods. For underwater cable installation, the primary methods utilized for installation will be water jetting, jet plowing, plowing, and dredging, with shoreline crossings completed by HDD. Further details of the cable installation methods and equipment are described below.

The majority of the overland portion of the Facility route is located within or immediately adjacent to the existing CP, CSX Railroad ("CSX"), and NYS Route 22 rights-of-way. A minimum separation distance is required from the rails to the cables by each railroad; CP requires a minimum separation of 10 feet from the centerline of the outermost track to the cable trench, and CSX requires a minimum separation of 25 feet from the centerline of the outermost track. The typical and preferred layout is to have the bipole (2 cables) installed on one side of the railroad tracks. With this layout, the limits of construction activity extend 40 feet beyond the required minimum setback of the railroads. This 40-foot area will include the area needed for excavation of the trench, installation of erosion and sediment control measures, installation of the two cables and stockpiling of excavated material. Along the railroad, the construction corridor will generally be 40 feet wide on one side of the track. There are areas that will require different configuration and pose additional engineering challenges, such as steep slopes, environmentally sensitive areas, and existing structures. These areas will be identified and site-specific engineering solutions will be developed as part of the EM&CP. A minimum construction corridor of 25 feet will be required along the edge of Routes 22 and 9W for installation of the HVDC bi-pole cables, although a wider width may be employed to allow for more efficient construction and quicker completion of the work in these areas. Along the Astoria-Rainey corridor, the construction corridor will adhere to the maximum allowable width as allowed by the City of New York. Occasional further lane closure will be necessary for excess spoil removal, material delivery, and similar operations.

Each of the two overland cables will require a number of joints and a flat pad will be installed underneath each joint for splicing activities. The number of joints will be kept to a minimum and will be determined either by the maximum length of cable that can be transported in a single piece or by the maximum length of cable that can be pulled, whichever is the least, as well as the number of HDD and J&B locations. The jointing is performed in a jointing pit, with typical general dimensions for two cables being 30 feet long, 12 feet wide, and 4 feet deep. The top dimension of the trench may vary due to soil type and equipment used. For land installation, maximum segment lengths between splices will be approximately one-half mile. The following sections identify the general construction sequence for routine cable installation along the overland portion of the Facility route:

- Initial clearing operations, stormwater and erosion control installation,
- Trench excavation,
- Cable installation,
- Backfilling, and
- Restoration and revegetation.

1.1.1.1 Initial Clearing Operations and Stormwater and Erosion Control Installation

Initial clearing operations will include the removal of vegetation within the cable trench area and within any temporary additional construction workspace (e.g., HDD workspace, access roads and staging areas) either by mechanical or hand cutting. Vegetation will be cut at ground level, leaving existing root systems intact except for the immediate trench area, and the aboveground vegetation removed for chipping or disposal. Tree stumps and rootstock will be left undisturbed in the temporary workspace wherever possible to encourage natural revegetation. Brush and tree limbs will be chipped and spread in approved locations or hauled off-site for disposal. Timber will be removed from the right-of-way for salvage or to approved locations.

The cleared width within the right-of-way and temporary construction workspace will be kept to the minimum that will allow for spoil storage, staging, assembly of materials, construction vehicle passage, and all other activities required to safely install the cables and associated equipment.

Prior to or closely following initial disturbance of the soil, erosion controls will be properly installed as required. Design of the stormwater and erosion controls will be completed as part of the EM&CP and will include measures such as silt fences, haybales, temporary mulching, etc.

1.1.1.2 Trench Excavation

The cables will generally be installed side-by-side with up to three feet of spacing and deep enough to provide for not less than three feet of cover over the cable. The typical trench will be 4 wide at the bottom and approximately 4 to 5 feet deep to allow for the proper depth and separation required for the burial of the cables. The excavated material will be placed next to the trench.

Should it become necessary to remove water from the trench, it will be pumped to a stable, vegetated upland area (where practical) or filtered through a filter bag or siltation barrier.

In normal terrain where the soil conditions range from organic loam, sand, gravel or other unconsolidated material and sufficient clearances exist, traditional excavation equipment will be used. The mixing of topsoil with subsoil will be minimized by using topsoil segregation construction methods in agricultural lands and wetlands (except when standing water or saturated soils are present). Topsoil will be stripped from the trench and subsoil stockpile area (trench plus spoil side method) and placed on one side of the trench. Subsoil will be placed on the other side of the trench or otherwise segregated.

Based on review of soils and geologic maps of the routing area, shallow bedrock has the potential to be encountered along some portions of the land segment of the alignment. Rock encountered during trenching will be removed using one of the following techniques. The technique selected is dependent on relative hardness, fracture susceptibility, and expected volume of the material. Techniques include:

- Conventional excavation with a backhoe,
- Hammering with a pointed backhoe attachment followed by backhoe excavation,
- Rock saw/trencher or
- Blasting followed by backhoe excavation.

All blasting activity will be performed by licensed professionals according to strict guidelines designed to control energy release. Proper safeguards will be taken to protect personnel and property in the area. Charges will be kept to the minimum required to break up the rock. Where appropriate, mats made of heavy steel mesh or other comparable material or trench spoil will be utilized to prevent the scattering of rock and debris. These activities will strictly adhere to all industry standards applying to controlled blasting and blast vibration limits with regard to structures and underground utilities. Blasting in the vicinity of nearby utilities and railroads will be coordinated with the owner, as necessary. Blasted rock will be hauled off-site and disposed of in an appropriate manner. Details of blasting controls and safety procedures will be specified in the site-specific EM&CP documents.

1.1.1.3 Cable Installation

For the overland sections of the Facility route, the two cables within the bipole system will typically be laid side-by-side (approximately 3 feet apart) in a trench approximately 4 to 5 feet deep to allow for not less than 3 feet of burial. Once a pre-selected length of trench is excavated to the necessary depth and the base prepared, rollers will be placed in the bottom of the trench (or along the upper rim of the excavation) to facilitate pulling the cable into the trench. A cable attached to a winch at the opposite end of the trench from the cable spool will be attached to the cable and reeled in, pulling the cable down the length of the trench on the rollers. Depending upon the soil conditions on the bottom of the trench, the bottom of the trench may have some padding fill placed before pulling the cable into the trench. Once the cable segment is pulled down the length of the trench, it is moved off the rollers.

Given the need to schedule work with the railroads and the overall construction schedule, it is anticipated that cable installation activities will occur twenty fours hour per day/seven days per week in most areas, with nighttime shutdowns occurring in select sensitive receptor areas. This approach will require that nighttime lighting be used. To the extent possible, directed lighting will be employed when in residential areas to minimize lighting of areas outside of the workspace. In addition, the continual construction schedule will result in the operation of heavy machinery and equipment (e.g., generators, excavators, and vehicle engines) during all hours of the day and night. Certain activities (e.g., blasting, pile-driving, etc.) may be limited to daytime periods, depending upon noise sensitivity of nearby areas if required.

During cable installation along railroad corridors, it is anticipated that the railroads will be used to transport heavy equipment such as cable drums to centralized stockpiling areas. Final transport of the cable spools, construction equipment, and supplies will be transported on roadways and so it will be necessary, for vehicles to arrive and depart from work areas via local roadways. Workers may arrive at contractor yards or the right-of-way in pickup trucks, supplies may be delivered directly to the site, and equipment such as dewatering pumps, generators, or excavators may also need to access the site via local roads. Along the NYS Route 22 and 9W corridors, all equipment and supplies will be delivered via the roadways. Within New York City, equipment and supplies will be delivered by roadway, rail, or water transport. Procedures for traffic management will be developed as part of the EM&CP and may include items such as detours, police details, and signage.

1.1.1.4 Backfilling

Subsequent to laying the cables, the trenches will be backfilled with low thermal resistivity material. Because the operation of the cables results in the generation of heat, and heat reduces the electrical conductivity of the cables, it is important to backfill with this material to prevent heat from one cable affecting a nearby cable. There will be a protective cover of high density polyethylene, concrete or polymer blocks directly above the low thermal resistive backfill material. The whole assembly will have a marker tape placed 1 to 2 feet above the cables. The top of the trench may be slightly crowned to compensate for settling. Excess clean spoil material from trench excavation will be disposed of by spoiling on site where approved, or properly disposed of off site at an approved location. Contaminated spoils will be disposed of as required by State regulation.

In areas of wetlands or perched water tables, trench plugs or other methods to prevent draining of wetlands or surface waters along the trench will be used. In areas of wetland soils, the organic surface layer will be backfilled over the subsoil backfill to reestablish an adequate surface soil profile for wetland restoration objectives. Another component of the backfilling process that will be assessed and addressed is soil compaction.

1.1.1.5 Restoration and Revegetation

Cleanup crews will complete the restoration and revegetation of the rights-of-way and temporary construction workspace. In conjunction with backfilling operations, any remnant woody material and construction debris will be removed from the rights-of-way. The construction area will be seeded with an approved seed mix for the temporary work area and allowed to further revegetate naturally. Paved areas will be restored to match existing conditions in accordance with NYSDOT requirements or applicable local standards.

1.1.1.6 Upland Crossings

The Facility route will result in multiple river, stream, road, and other crossings by the Facility cables and construction equipment. Cable installation options that will be under consideration include trenching, HDD installation (see Section 1.1.3 below), or attachment to existing structures such as bridges or railroad trestles. The specific design for each crossing will address the conditions at the particular location, owner / operator design requirements and the preferences of Engineering, Procurement and Construction ("EPC") contractor, or the Conditions of the Article VII Certificate of Environmental Compatibility and Public Need (Certificate) and will be detailed in the EM&CP. However, the routing for the three major river crossings—the Hudson River at Rogers Island, the Mohawk River at Glenville and Schenectady, and Catskill Creek at the Village of Catskill—will either have the cables installed in conduits to be attached to existing bridge structures or installed beneath the waterbody via HDD.

1.1.1.7 Environmental Training

Environmental training will be given to construction contractor personnel whose activities may impact the environment during cable installation. The level of training will be commensurate with the type of duties of the personnel. The training will be given prior to the start of construction and throughout the construction process, as needed for new workers arriving on-site. The training program will cover the job-specific permit conditions, company policies, cultural resource procedures, procedures for threatened or endangered wildlife species under 6 NYCRR Part 182 ("TE species") and rare, threatened or endangered plant species under 6 NYCRR Part 193 ("RTE plants"), Spill Prevention Control and Countermeasures ("SPCC") Plan, State Pollutant Discharge Elimination System ("SPDES") Stormwater Pollution Prevention Plan, and any other pertinent information. In addition to those with environmental monitoring and compliance responsibilities, all other construction personnel are expected to play an important role in maintaining strict compliance with all permit conditions to protect the environment during construction.

1.1.2 Underwater Cable Installation Methodology

The two underwater cables associated with the HVDC Transmission System bipole will be bundled and laid within the same trench. The cables will be initially placed in a vertical position in the trench, although sediment conditions may allow for slumping into a horizontal position relative to each other. Generally, the underwater power cables will be manufactured with armoring and buried primarily at a 6-foot depth in the Hudson, Harlem, and East Rivers, from zero (0) to four (4) feet within Lake Champlain[1] north of Crown Point and three (3) to four (4) feet within Lake Champlain south of Crown Point. Cable burial will generally be performed at the same time the cable is laid or at a later date, as deemed appropriate or necessary due to subsurface conditions. The cables will be laid by specialized cable-laying vessels or a specially outfitted laybarge, depending on navigation constraints along the Facility route.

The cable will be transported from the manufacturer by a special cable transport vessel and transferred onto the cable installation vessel. The linear cable machines onboard the installation vessel will pull the cables from coils on the transport vessel onto the installation vessel and into prefabricated tubs. After the cable has been transferred, the installation vessel will travel to the construction commencement location. This process will be repeated as necessary to deliver and install the cable along the length of the various waterways.

Given the need for certain installation activities to occur uninterrupted (e.g., HDDs at shoreline installations, and jetting), it is anticipated that cable installation activities will occur twenty four hours per day/seven days per week in most areas, with nighttime shutdowns occurring only in select sensitive receptor areas. This will require that nighttime lighting be used. Directed lighting will be employed to avoid and/or minimize lighting of areas outside of the workspace. In addition, the continual construction schedule will result in the operation of heavy machinery and equipment (e.g., generators, water pumps, and vessel engines) during all hours of the day and night. Certain activities may be limited to daytime periods depending upon noise sensitivity of nearby areas.

Based on the sediment data collected in the Spring 2010 Marine Route Survey (Supplement, Attachment E; Joint Proposal Exhibit 31), it is not anticipated that a backfill plow will be needed. As the cables will be simultaneously laid and buried, the majority of sediments will refill the trench. In addition, due to the natural dynamic processes in the lakes and rivers, sediments will be naturally deposited within the trench. Post-installation bathymetric and sediment surveys will be conducted to monitor benthic habitats and sediment conditions.

[1] Depth in Lake Champlain will be determined by sediment hardness, water depth, etc.

1.1.2.1 Jet Plow / Water Jetting

The proposed method for laying and burial of the majority of the underwater cable is by the jet plow / water jetting embedment process. These methods involve the use of a positioned cable vessel and a hydraulically powered water jetting device that simultaneously lays and embeds the underwater cable in one continuous trench. At this time, the primary proposed installation vessel will be dynamically positioned, using thrusters and the vessel propulsion system. In relatively shallow water depths (typically less than 15 feet), shallow draft vessels/barges, which typically use anchors for positioning, may be used for installation. Deeper draft vessels equipped with dynamic positioning thrusters are proposed for deeper water locations. Dynamically positioned cable installation vessels do not contact or impact the bottom; however, depending on navigation limitations along the Facility route, it is possible that a tugboat-positioned vessel or an anchor-positioned vessel may be used for some or all of the cable installation. An anchor-positioned vessel will propel itself along the Facility route with forward winches while letting out on aft winches with other lateral anchors holding the side-to-side alignment during the installation. The 4-to-8 point anchor mooring system will require an anchor-handling tug to move anchors while the installation and burial proceeds uninterrupted on a 24-hour basis.

Jet plow / water jetting embedment methods for underwater cable installations are considered to be the most effective and least environmental impacts when compared to traditional mechanical dredging and trenching operations. This method of laying and burying the cables simultaneously ensures the placement of the underwater cable system at the target burial depth with minimum bottom disturbance, with much of the fluidized sediment settling back into the trench. For these reasons, it is the installation methodology that appears to be preferred by state and federal regulatory agencies based on review of past underwater cable projects.

Jet Plow / water jetting equipment uses pressurized water (taken from existing waterbodies) from water pump systems onboard the cable vessel to fluidize sediment. The water jetting device is typically fitted with hydraulic pressure nozzles located down the length of “swords” that are inserted into the sediment on either side of the cable and which create a direct downward and backward “swept flow” force inside the trench. This provides a down and back flow of re-suspended sediments within the trench, thereby “fluidizing” the *in situ* sediment column as the equipment progresses along the cable route such that the underwater cable settles into the trench under its own weight to the planned depth of burial. The water jetting device’s hydrodynamic forces do not work to produce an upward movement of sediment into the water column, since the objective of this method is to maximize settling of re-suspended sediments within the trench to bury or “embed” the cable system. The pre-determined deployment depth of the jetting swords controls the cable burial depth using adjustable hydraulics on the water jetting device.

The cable system location and burial depth will be recorded during installation for use in the preparation of as-built location plans. The water jetting device is equipped with horizontal and vertical positioning equipment that records the laying and burial conditions, position, and burial depth. This information is monitored continually on the installation vessel. This information will be forwarded to appropriate agencies and organizations as required for inclusion on future navigation charts.

Burial can be performed by either a towed or self-propelled burial machine. In this instance the self-propelled water jetting device moves forward by the reaction of the backward thrust of the hydraulic jetting power that is fluidizing the soil and keeping the created trench open for the cable to sink into. The forward rate of progress is regulated by the varying types of soil and the water pressure applied through the jets.

A skid/pontoon-mounted jet plow /water jetting device or wheeled, frame-mounted water jetting device, deployed and operated in conjunction with the cable-laying vessel, is proposed for the underwater installation operations. For burial, the cable vessel is used as the platform to operate the water burial device at a safe distance as the laying/burial operation progresses. The cable system is deployed from the vessel to the funnel of the water jetting device. The water jetting swords are lowered onto the bottom, pump systems are initiated, and the jet trencher progresses along the cable route with the simultaneous lay and burial operation. It is anticipated that, to install the cables to the target depth of 6 feet of sediment cover, the jetting device will fluidize a pathway approximately 2 feet wide and approximately 7 feet deep into which the cable settles through its own weight. The pontoons can be made buoyant to serve different installation needs.

Temporarily re-suspended *in situ* sediments are largely contained within the limits of the trench wall, although a small percentage of the re-suspended sediments are transported outside of the trench. Any re-suspended sediments that leave the trench generally tend to settle out quickly in areas immediately flanking the trench. However, the amount of sediment transported out of the trench, the residence time of sediment suspension, and the distance suspended sediments are transported are dependent upon multiple factors, including sediment grain-size, composition, hydrodynamic forces, trench depth and the hydraulic jetting pressures imposed on the sediment column necessary to achieve desired burial depths.

As the jetting device progresses along the route, the water pressure at the device nozzles will be adjusted as sediment types or densities change to achieve the required water quality standards. A test trench may be preformed to ensure proper depth of burial. In the unlikely event that the minimum burial depth is not met during water jetting embedment, additional passes with the water jetting device or the use of diver-assisted water jet probes will be utilized to achieve the required installation target depth.

Jet water pressure varies with different bottom sediment materials, with typical pressures including:

Material	Estimated Jet Water Pressure
Sand and Silt	400-600 psi
Soft Clay	600-800 psi
Hard Clay	800-1,000 psi

Some types of water jetting devices also employ an ejector system to assist in the trenching operation in certain sediment types that do not fluidize well. The ejector system employs an airlift system to create a suction force within the ejector pipes that entrains sediment and releases it at the end of the ejector pipes to either side of the water jetting device. This addition to the water jetting methodology will only be employed to assist in burial if monitoring of the installation reveals difficulty in obtaining the required burial depth due to lack of adequate fluidization of sediments.

In addition to continuous closed circuit video monitoring, divers will make regularly scheduled dives in order to monitor the cable installation operation and inspect the condition of the cable trench and jet sled. Occasionally, the jet sled may require maintenance during cable burial operations due to nozzle wear or loss. During these maintenance periods, the jet leg roller load cells, suction piping, and hose connections are checked, and hydraulic fluid is replenished as required. An SPCC Plan or its equivalent will be developed and will be followed during construction equipment maintenance and repair activities.

In certain small areas – typically transition areas between shoreline HDDs and underwater cable trenches – a diver- operated hand jet or ROV may be used to bury the cable. In this process, a support vessel provides pressurized water through a hose with a nozzle that is maneuvered by a diver or ROV. The jet of water works the sediment under the cable to create a trench into which the cable settles. This method will be employed for short distances only, typically less than 100 feet.

1.1.2.2 Plowing

For the plowing technique, a trench is made for the cable by towing a plow, and the cables are simultaneously fed into the trench as it is created by the plow. The plow is not self-propelled, but is instead tethered to a surface support vessel, which supplies the pulling power. Usually, the bottom sediment is allowed to naturally backfill the trench over the cable by slumping of the trench walls, wave action, or bed load transport of sediments.

In the southern portion of Lake Champlain, shear plowing will be employed. Shear plows can potentially reduce sediment disturbance as they do not fluidize the sediment and generally require less force to create a narrower trench in the lakebed to bury underwater cables than other types of cable installation equipment. Some issues which affect the suitability of shear plows for underwater cable installation and burial are sediment cohesiveness and burial depth. Use of the shear plow is typically limited to sediments that have shear strengths (kpa) less than 20 kpa. Also, shear plows are typically used with shallower burial depths (less than four feet), which generally reduces the overall amount (i.e., volume) of sediment disturbed during installation. Sediment shear strength and proposed cable burial depth in Lake Champlain are suitable for use of the shear plow; thus, this equipment is being considered for cable installation and burial in the portion of Lake Champlain from Crown Point to the Dresden landfall.

When compared to nominal jet plow operations, the shear plow results in a relatively narrower estimated trench and a smaller estimated percentage of re-suspended sediments (2%), as sediment cohesive strengths and burial depths suitable for shear plow use generally require less force. The total suspended solid (“TSS”) loading is the rate of sediment mass re-suspended into the water column above, which is a function of the trench cross-sectional area, the plow speed, the force required to overcome sediment shear strength, the percentage of re-suspended sediment, sediment porosity, and density. The shear plow would reduce the cross-sectional area of the trench and require less force than that normally achieved through jet plow operations, thus reducing the likely percentage of re-suspended sediment.

1.1.2.3 Dredged Trench Excavation (Conventional Dredging)

While it is intended that the use of conventional underwater trench excavation methods will be avoided or minimized, there will be some locations where conventional dredging will be used to meet required installation depths, or to install coffer dams associated with shoreline HDD installations. These circumstances may include instances where the cable route crosses an existing federal navigation channel. In these locations, either a clam-shell dredge or a barge-mounted excavator will be used to pre-dredge a trench into which the cable will be laid. The trench will typically be over-excavated by approximately 20 percent to allow for slumping of trench sidewalls prior to cable installation. Trench spoil will be brought to the surface and placed on barges for approved disposal. Trench spoil will not be used for backfill. This work will most likely occur from spud barges, although anchor-moored or jack-up barges may also be employed, depending upon equipment availability and site conditions. A typical spud dredge barge will be equipped with two or more legs, with one spud being a walk-away spud. The barge will have a crane, typically outfitted with a 6 to 9 cubic yard clamshell bucket. Alternatively, the barge may have a track hoe excavator working off the deck of the barge, possibly with an extended boom for areas of deeper water. Once a segment of trench is excavated, cable will be laid, and the clam-shell dredge or excavator will place clean backfill sediment back into the trench.

1.1.2.4 Non-Burial Installation

In Lake Champlain where the water depth is one hundred fifty feet (150) or greater, the cables may be buried at shallower depths or laid on the lake bed provided a report by a recognized authoritative technical consultant demonstrates and concludes that public health and safety can be appropriately protected without such burial. The report would be provided with the EM&CP for this segment and the proposed installation method must be approved by the Public Service Commission.

In limited areas along the Facility route, surficial geology may not permit adequate cable burial depths within the lake- or riverbed to ensure adequate cable protection. In these areas, the HVDC cables will be laid on the lake- or river-bed with protective coverings, such as rip-rap or articulated concrete mats. Areas where this method may occur are at foreign pipeline or cable crossings, unavoidable bedrock areas, and potentially in areas of contaminated sediments. In these locations, the plow or water jetting device will be lifted off the bottom, moved forward past the obstacle and then re-deployed to the bottom once safely across. In a separate activity, the cable laying on the sediment surface will be covered with sloping stone rip-rap, articulated concrete mats, grout mattresses, or pillows. Typically, this method will be used only for short distances.

Articulated concrete mats are made of small pre-formed blocks of concrete that are interconnected by cables or synthetic ropes in a two dimensional grid. The size of the area would be dictated by the extent of the obstacle to burial, but the mats typically range from 6 feet by 6 feet to 8 feet by 25 feet. The concrete mats are lifted off barges and lowered into the water over the cable using a crane. Positioning is monitored by divers. Rip-rap will be sized to remain in place under current and wave conditions expected at the site. Rip-rap will be lowered from a supply barge using either a clamshell dredge or an excavator. Rip-rap thickness will be monitored by divers to prevent over- or under-placement of material. This type of cable installation and protection is similar to methods potentially used for certain infrastructure crossings, as further described below. The location of these areas will be identified for appropriate engineering as part of the EM&CP.

1.1.2.5 Infrastructure Crossing Installation Methodology

Preliminary review of the underwater cable route identified numerous areas where construction activities will occur in the vicinity of existing infrastructure (e.g., electric cables, gas pipelines, ferry cables, etc.) that must be crossed. Based on a review of New York State Office of General Services ("NYOGS") records and other sources, the Applicants provided a list of known submarine infrastructure crossings in the Supplement, Attachment K (Joint Proposal Exhibit 37).

There are several different installation techniques that can be utilized when crossing existing infrastructure based on the type, burial depth, and existing protective coverings of the infrastructure. In almost all cases, it is anticipated that the underwater cables will be laid over the existing infrastructure with protective coverings (e.g., rip-rap or articulated concrete mats). The design of utility crossings will follow industry standards. An overview of typical methods for crossing of utilities was shown in the Application, Exhibit E-3, Figure E-3-8 and is shown in the Best Management Practices ("BMPs") (Appendix F to Joint Proposal).

Crossing of utilities owned by a third party, such as existing cables and pipelines, will require formal crossing agreements to be made. The design of the protection at these crossings will be subject to such agreements. Detailed discussions on coordination, design and installation methodologies and safety issues will be conducted with the owners of these infrastructures, as specified in the recommended Certificate Conditions. The detailed designs for each crossing will be provided as part of the EM&CP.

<u>Crossing of Fiber Optic and Telecommunication Cables</u>

Wherever possible, the HVDC cables will cross existing fiber optic and telecommunication cables at right angles, extending approximately 150 to 300 feet in length. The method of embedding and protection will be determined by the burial depth of the existing cables.

A minimum separation between the new transmission cables and existing cables will be provided by various methods such as Uraduct® covering on one or both sets of cables, protection of the existing cable with grout pillows, split duct or flexible concrete mattresses, burying the existing cable deeper or a rip-rap covering. The exact crossing method will be custom designed for each location. The details of these crossings will be coordinated with the owners of the existing facilities.

In some cases, existing telecommunication cables are buried less than 3 feet; therefore, special measures may be utilized at the crossing site, such as the use of protective sleeves on the HVDC cables. The details of these crossings will be coordinated with the owners of the existing facilities.

Crossing of Gas or Oil Pipelines and Power Cables

Where the HVDC cables cross existing pipelines or power cables, the HVDC cables will cross the existing infrastructure as close as possible to right-angles, extending up to 300 feet on each side of the crossing point. The method of cable embedding and protection will be determined by the burial depth of the existing infrastructure.

For deep-buried pipelines or cables, a protective sleeve will be applied to the HVDC cables at each crossing to provide a minimum separation between the HVDC cables and the existing infrastructure. The sleeve will be installed for up to 80 feet to either side of the crossing location to ensure that it will cover the crossing point. The HVDC cables, including the portion with sleeve protection, will be buried by water jetting or plowing to the target depth or as limited by the actual burial depths of the existing pipeline or cable.

For shallow buried cables or pipelines, a minimum separation between the HVDC cable and the other cable or pipeline will be provided by pre-installing a 150 millimeters (mm)-thick grout-filled mattress on top of the infrastructure at each crossing. The HVDC cable and pipeline will be post-lay protected by further placement of grout-filled mats or articulated concrete mats. The HVDC cables will be buried using the water jetting device to the target depth, as close as possible to the grout-filled mats.

Crossings of Other Infrastructure Types

A "chain-ferry" operates across the proposed underwater cable route within Lake Champlain. The chain ferry utilizes ferry cables laid on the bottom of Lake Champlain. The normal penetration of the ferry cables into the lakebed will be assessed, and if deemed necessary, additional protection in the form of deeper HVDC cable burial at the crossing point or the use of an outer protection sleeve against abrasion will be installed. The ferry cables will be temporarily removed to facilitate the installation of the underwater cables. The ferry cables will then be replaced over the top of the transmission cables. The ferry operator reports that its cables are replaced every four years; therefore, there may be an opportunity to coordinate the HVDC cable installation schedule with the ferry cable replacement schedule. Detailed coordination and discussions will be required with the ferry operator on methodologies and scheduling.

The underwater HVDC cables will also be routed beneath overhead infrastructures, including road bridges and electrical transmission lines. These will not be of concern for the cable systems once in operation, but the superstructure on the cable-laying vessels will be designed to take account of any height restrictions.

1.1.2.6 In-Water Support Vessels

Because of their size and need to stay on-station for long periods of time, the major cable-laying or burial vessels will not make daily or frequent movements to ports. Instead, these vessels will be supported by a variety of smaller vessels that will support crew shift changes, bring supplies, re-fuel, and monitor the installation work. Geophysical survey vessels may be used to assess cable installation adequacy of burial depth and, where necessary, review backfilled conditions of the lake- or river-bed. Support vessels may also be on-hand to facilitate the installation of the cables along existing bridge structures at the crossings of the Hudson River at Fort Edward, the Mohawk River at Schenectady, and Catskill Creek at the Village of Catskill.

On-water refueling may be necessary not only for vessel engines but also for cranes, excavators, diesel generators, diesel water pumps, etc. Refueling will be performed with care to minimize the potential for spills. Spill control and clean up materials will be onboard all refueling vessels to handle small spills, but for larger spills, a specialty marine spill contractor will be on-call for immediate response. Proper reporting protocols will be followed in the event of reportable quantities of fuel or other pollutants being discharged to the water. These protocols will be outlined in the EM&CP.

Good housekeeping practices will be enforced on all vessels to prevent the unintentional discharge of trash and debris overboard. Routine inspections of working deck surfaces will be performed and debris and trash will be removed expediently into trash receptacles.

1.1.3 Horizontal Directional Drilling

HDD is a common technique used for transmission cable installation projects to avoid or minimize environmental impacts as well as to address engineering or infrastructure constraints associated with traditional trench installation (e.g., major highway crossings). HDD is a trenchless method for installing pipelines and conduit beneath other facilities or resources of concern, including habitats, archeological sites, waterbodies, or existing infrastructure. HDD is a multi-stage process composed of the four steps listed below and further depicted in the Application, Exhibit E-3, Figures E-3-1, E-3-2, and E-3-3:

- Pre-site planning,
- Drilling a pilot hole,
- Expanding the pilot hole by reaming if necessary,
- Pull back of drill string with simultaneous installation of conduit, and
- Cable pull through the conduit.

The HVDC cables cannot be installed via shallow burial where in close proximity to railroad trestles for river or road overpasses; therefore, the HVDC cables will be installed within conduits that are installed under those roads or watercourses utilizing HDD techniques. Cable installation will be site-specific at each crossing point, but typical examples of HDD cable installation techniques along railroad and roadway crossings are shown in the Application, Exhibit 5, Figures RR 001, RR 002, RR 003, RR 004, and RR 005.

For each proposed HDD location, two separate drills will be required, one for each cable. Each cable will be installed within a 10-inch-diameter, or larger, high density polyethylene (HDPE) casing. To maintain appropriate separation between the two cables, a minimum of 6 feet will be required between each drill path. HDD will be employed in a number of situations during construction, including both overland sections of the Facility route and at shoreline crossing locations. Overland HDD will have both the entry and exit holes staged on land. For the shoreline crossing HDDs, the entry hole is typically staged on land and the exit hole is staged from the water. Locations of all proposed HDD installations will be identified and all HDDs will be engineered on a site-specific basis during development of the EM&CP. A preliminary indication of locations where HDD is likely to be used has been developed and is included as an exhibit to the Joint Proposal

At the transition of the HVDC underwater cables from water to land, installation will be accomplished through the use of HDD methodology in order to avoid or minimize disturbance to the banks and near shore areas. The HDD will be staged at the onshore landfall area and involve the drilling of the boreholes from land toward the offshore exit point. Conduits will then be installed through the length of the boreholes and the transmission cable will be pulled through the conduits from the submarine end toward the land. A transition manhole or transmission cable-splicing vault will be installed using conventional excavation equipment (backhoe) at the onshore transition point where the underwater and overland transmission cables will be connected.

A drill rig will be setup onshore behind a bentonite pit, where a drill pipe with a pilot-hole drill bit will be set in place to begin the horizontal drilling. Drilling fluid will then be pumped into the hole as the cutting head is advanced into the soil. The HDD construction process will involve the use of drilling fluid in order to transport drill cuttings to the surface for recycling, aid in stabilization of the *in situ* soil/sediment to keep the hole open, and to provide lubrication for the HDD drill string and down-hole assemblies. This drilling fluid is composed of a carrier fluid and solids. The selected carrier fluid for this drilled crossing will consist of water (approximately 95 percent) and inorganic bentonite clay (approximately 5 percent). The bentonite clay is a naturally occurring hydrated aluminosilicate composed of sodium, calcium, magnesium, and iron that is environmentally benign.

After each section of drilling, an additional length of drill pipe is added until the final drill length is achieved. To avoid or minimize the release of the bentonite drilling fluid into the water, freshwater may be used as a drilling fluid to the extent practicable for the final section of drilling, just prior to the drill bit emerging in the pre-excavated pit. This will be accomplished by pumping the drilling fluid out of the drill stem and replacing it with freshwater as the drill bit nears the pre-excavated pit. When the drill bit emerges in the pre-excavated pit, the bit is replaced with a hole-opening tool called a reamer to widen the borehole. It is anticipated that a single reaming pass will be necessary to allow installation of the conduit. Once the desired hole diameter is achieved, a pulling head is attached to the end of the drill pipe and the drill pipe is used to pull back the HDPE conduit pipe into the bored hole. As with the pilot hole drilling process, freshwater will be utilized, if practicable, as the reaming tool nears the pre-excavated pit. Once the HDPE conduits are in place, the underwater cables will be pulled through the conduit, which will be permanently sealed at each end to complete the installation process.

To further facilitate the HDD operation, a temporary cofferdam may be constructed at the offshore exit hole location. The cofferdam will be rectangular in shape and will be open at the end facing away from shore to allow for manipulation and pull back of the conduits and the cables. The area enclosed by the cofferdam will be typically approximately 16 feet wide by 30 feet long with a depth determined based on existing conditions. The cofferdam will be constructed using steel sheet piles driven from a barge-mounted crane. The cofferdam is intended to help reduce turbidity associated with the dredging and HDD operations as well as to help maintain the exit pit.

The area inside the cofferdam will be excavated to create an exit pit at the waterward end of the borehole. Approximately 140 cubic yards of sediment will be excavated from within the cofferdam. The dredged material will be temporarily placed on a barge for storage and ultimate disposal at an appropriately permitted facility. At the end of cable installation, the exit pit will be backfilled with clean sand to restore the bottom to preconstruction grade.

After the HDD conduit is installed, the ends of the conduit will be sealed with plastic cups until the subsequent installation of the electric cable. After the electric cable has been installed it is anticipated that the excess annular space with the HDD installed conduit and the installed electrical cable will be backfilled with a thermal grout to help dissipate excess heat generated by the cable. The requirements for the backfill material will be determined in the EM&CP.

The drilling fluid system will recycle drilling fluids (made up of a combination of water, bentonite, and the material being excavated) and contain and process drilling returns for offsite disposal. Although considered environmentally benign, the discharge or release of drilling fluids to the water will minimized by implementing appropriate techniques and controls to be specified in a drilling fluid overburden breakout monitoring and response plan. It is likely that some residual volume of drilling fluid will be released into the pre-excavated exit pit when the pilot hole and reaming cutting heads come to the surface. The depth of the pit and the temporary cofferdam are expected to contain much of the drilling fluid that may be released into the exit pit.

It is expected that the HDD conduit systems will be drilled through sediment overburden at the landfall location. However, it is anticipated that drilling depths in the overburden will be sufficiently deep to avoid pressure-induced breakout of drilling fluid through the sediments along most of the length of the drill path. Nevertheless, a visual and operational monitoring program will be implemented during the HDD operation to detect a fluid loss. This monitoring includes:

- Visual monitoring of surface waters along the drill path and in the vicinity of the exit hole on a daily basis to observe potential drilling fluid breakout points.
- Drilling fluid volume monitoring by technicians throughout the drilling and reaming operations for each HDD conduit system.
- Implementation of a fluid loss response plan and protocol by the drill operator in the event that a fluid loss occurs. The response plan could include injection of loss circulation additives such as Benseal that can be mixed in with drilling fluids at the mud tanks, and other mitigation measures as appropriate.

1.1.4 Cable Installation Methodologies Utilized Along the Route

Cable installation methodologies utilized along the Facility route vary based on a number of factors, including but not limited to: sediment type and hardness, bathymetry, and infrastructure crossings.

Sediment types along lake and river portions of the route influence underwater cable design and protection requirements. The substrate composition and associated cable installation methods will vary along the underwater cable route. For example, stiff clay sediments can hinder submarine cable burial and can affect heat dissipation and cable performance. Rock outcroppings and areas of bedrock can prevent cable burial and will require additional cable cover and protection measures to prevent excess wear and cable fatigue. Silt, sand and gravelly sands are the preferred sediment types for cable installation in the underwater portions of the cable route; therefore, the cable route has been sited within the preferred sediment types wherever possible.

Bathymetry is also an important factor to consider during submarine cable burial, protection, and installation. Steep or abrupt underwater bathymetry makes cable installation more difficult and can affect cable design and life-span performance.

Crossing of submerged infrastructure, such as other underwater cables and pipelines requires special HVDC installation techniques based on the type, size, and burial depth of the existing submerged infrastructure, as described above. The HVDC underwater cables will encounter submerged infrastructure in several locations along the proposed route. The current owners/operators of such structures will be contacted to coordinate appropriate crossing design for the HVDC cables, and to determine the level of coordination necessary to deploy and operate the cables in proximity of those structures. Each of these situations will be identified and site-specific engineering will be used to design the appropriate method to address each situation. Site-specific engineering will be provided in the EM&CP.

General installation methodologies and descriptions of specific sections of the cable route are described in the following sections.

1.1.4.1 Canada / United States Border to Dresden, New York

The HVDC Transmission System route within the New York begins at the international border within Lake Champlain and continues south for approximately 101.5 miles to the Town of Dresden. Two HVDC underwater cables will be installed within the New York jurisdictional waters of Lake Champlain along a relatively direct north to south route that facilitates the depths required for the cable-laying vessels while also avoiding the deepest portions of the lake (to avoid the need for double-armored cables). The underwater cables may be transported from New York on cable transporting vessels through the Champlain Canal, or by train from Montreal followed by transfer to a vessel for transport down the Richelieu River.

As the HVDC Transmission System cable route enters Lake Champlain from the Richelieu River, water depths range from approximately 6 to 50 feet. The HVDC underwater cables follow a 55-mile route crossing Lake Champlain towards Fields Bay, with water depths varying from very shallow to more than 400 feet; the cable route will avoid areas that are too shallow for the cable-laying vessel to navigate or areas that are too deep for the single-armored cables. The 15-mile section from the Fields Bay area to the Lake Champlain Toll Bridge and south to Dresden is a continuation of Lake Champlain. Much of the lake's length south of the Lake Champlain Toll Bridge is similar to that of a river, with water depths in the central portion ranging between 20 and 30 feet.

Within Lake Champlain, the HVDC underwater cables are anticipated to be buried by water jetting or shear plow from the international border to Crown Point, then shear plowed south. Numerous submarine cables (some of which are decommissioned) have been identified within Lake Champlain and will require special techniques for cable crossings. In areas where the HVDC underwater cables cross existing submerged infrastructure, the cables will utilize the aforementioned methodologies for infrastructure crossings, as appropriate.

In addition to numerous submarine cables, a ferry cable system is located at the bottom of Lake Champlain. As discussed above, it is anticipated that coordination with the cable ferry service will be required in order to temporarily remove the ferry cables to facilitate burial of the underwater transmission cables underneath the ferry cables.

1.1.4.2 Dresden, New York to Catskill, New York

South of the Lake Champlain-Dresden landfall, the HVDC Transmission System cables will utilize an HDD to transition from the water, across private lands to right-of-way of NYS Route 22. The two HVDC cables will be generally buried within excavated trenches from the landfall to the Village of Whitehall, with HDD installation proposed for the crossing of the South Bay and portions of Route 22 before connecting with the CP railroad right-of-way in the Village of Whitehall. After approximately 64.8 miles within this right-of-way, the cables will switch to the CSX right-of-way at Rotterdam and proceed southerly for approximately 51 miles to the hamlet of Cementon in the Town of Catskill. Along this portion of the Facility route, the two HVDC land cables will primarily be buried in excavated trenches within the railroad and roadway rights-of-way. HDD methods will be used as necessary at existing infrastructure crossings and other obstacles including shoreline crossings. Routing for the Hudson River at Fort Edward, the Mohawk River at Glenville-Schenectady, and Catskill Creek at the Village of Catskill will either have the cables installed in conduits to be attached to existing railway bridge structures or, installed beneath the waterbody via HDD. Within the City of Schenectady, the proposed routing calls for leaving the railroad ROW and placement within Erie Boulevard, as the city is currently planning to renovate that road in 2012 to replace all services. However, in the event that the HVDC Transmission System cables cannot be installed within the timeframe that the city will be conducting construction along Erie Boulevard, the city agreed to work to identify another acceptable route through the city. The final route would be provided in the EM&CP for this segment.

1.1.4.3 Catskill, New York to Stony Point, New York

The HVDC cables will leave the overland Facility route and enter the Hudson River in the Town of Catskill using HDD methods. Upon entering the Hudson River, the HVDC underwater cables will extend along the Hudson River for approximately 67 miles to Stony Point, Rockland County, using the jet plow as the primary burial method.

In general, the Hudson River is composed of five major surficial sediment types:

- Mud (clay, silt, fine sands);
- Sands with a smooth to mottled bottom;
- Coarse gravel and sand mixtures with irregular bottom composed of compact gravel and cobble deposits intermixed with sand;
- Mix of mud, sand, and gravel; and
- Bedrock, cobbles, and boulders that are often overlain by a variable thickness of unconsolidated sediments.

Within the Hudson River, a minimum 32-foot deep navigation channel is maintained from Albany to New York City. The channel is 600 feet wide from New York City to Kingston and 400 feet wide from Kingston upstream to Albany. For the majority of the cable route within the Hudson River, the HVDC cables have been sited outside of the navigation channel. However, there are limited areas where siting constraints will require the cables to cross the navigation channel in order to avoid sensitive resources. Portions of the defined navigation channel which are not naturally deep enough are maintained by periodic dredging by the USACE.

Significant levels of river traffic are anticipated to continue in the future, especially in proximity to New York City, resulting in a greater possibility of ships' anchors damaging the cable; therefore, cable burial and protection methodologies will be carefully evaluated within this portion of the HVDC Transmission System route. The Applicants have held meetings with the U.S. Coast Guard and the Energy Subcommittee of the Harbor Operations Safety and Navigation Committee to discuss formal and informal anchorage areas along the Facility route.

There are also a number of locations within the Hudson River where the underwater cable will cross existing submerged infrastructure, such as submarine cables and pipelines. Existing infrastructure has been identified within the Hudson River at locations including Kingston, Marlboro, Clinton Point, Poughkeepsie, Palisades, Roseton, Highland Falls, Buchanan, and Stony Point. The Applicants have worked with the NYOGS to identify all such possible facility crossings. Additionally, infrastructure will be identified when a detailed marine survey is completed prior to construction of the system. Where the HVDC underwater cables will cross existing infrastructure, the cables will be installed according to the aforementioned methodology for infrastructure crossings, as appropriate.

1.1.4.4 Stony Point, New York to Clarkstown, New York

The HVDC Transmission System cables will utilize an HDD to exit the water at Stony Point, Rockland County to the CSX rail right-of-way. The cables will also cross the Stony Point State

Historic Site via HDD, to minimize intrusion into this NYSOPRHP property, which is an important destination and scenic site associated with the Revolutionary War. South of the State Historic Site, the cables will be buried in trenches generally within or along CSX right-of-way, with some minor deviations to accommodate infrastructure and other constraints. At the border of Haverstraw and Clarkstown, an HDD will be established to install the cables under Rockland Lake State Park and Hook Mountain State Park. The cables will be located in the Route 9W right-of-way for a short distance before another HDD is used to install the cables under the state parks again and transition into the Hudson River. The total distance of this overland bypass is 7.7 miles.

1.1.4.5 Clarkstown, New York to Astoria, Queens, New York City

Upon entering the Hudson River, the HVDC underwater cables will extend along the bed of the Hudson River for approximately 20.7 miles to the Spuyten Duyvil, which leads to the Harlem River. Within the Harlem River, water depths range from approximately 14 to 27 feet, extending from the Hudson River confluence to the East River confluence. Based on an evaluation of the environmental conditions within the Harlem River, it is anticipated that the HVDC underwater cables along this section will be installed using the jet plow technology and cover with concrete mattresses or alternatives in areas of exposed bedrock.

The cables extend within the Harlem River for approximately 6.6 miles before exiting the water within an existing railway corridor in the borough of Bronx in New York and extending for approximately 1.1 miles across the South Bronx railyard, and beneath the Robert F. Kennedy Bridge. The cables will be installed via HDD into the East River from the Bronx, and buried in the riverbed for less than one mile to another HDD landfall and take a southerly overland route to the Luyster Creek converter station site in the borough of Queens, New York. The converter station will be a "compact type" with a total footprint (i.e., building and associated equipment) of approximately 5 acres. HVAC cables will connect the converter station to a recently constructed substation. Based on an evaluation of the environmental conditions within the East River, it is anticipated that the HVDC underwater cables along this section will be primarily installed and buried using the jet plow technology. The Astoria-Rainey Cable will be buried beneath the streets of New York City for a distance of approximately three miles before connecting to the Rainey substation.

1.1.5 Convertor Station Construction

Construction activities at the converter station site would overlap and would include grading and site preparation, foundation construction, erection of major equipment and structures, and installation of electrical and control systems. Construction of the converter station will commence following site clearing and rough grading of the site. The site will be leveled and portions built up to the design grade, above the 100-year storm level. The building foundation slab will be cast on the prepared subgrade and the building structure constructed on that surface.

The building will house the high-voltage DC systems (reactors, filters, and valves) and control equipment with the alternating equipment located immediately outside the converter station building. To ensure proper installation and operation, the converter station equipment installation, testing and commissioning will be performed under the direction of the equipment manufacturer. The site would receive an architecturally appropriate treatment in areas that are visible to the public.

1.1.6 Construction Support Work Areas

Additional construction support work areas such as lay down and storage areas, access roads and additional temporary workspace will be necessary to facilitate construction. Location and specific size of the support areas will vary based on the final engineering and construction plan and will be provided as part of the EM&CP.

1.1.6.1 Overland Cable Installation Support Facilities

Overland portion of the Facility route will require additional support areas at locations along the length of the route to be determined in final project design. Examples of support facilities envisioned include: contractor yards, storage areas, access roads, and additional work space. Areas where additional work space may be required are HDD locations, cable jointing locations, and areas with steep slopes. In addition, transportation of the construction equipment and materials will be by rail to the extent practicable. To the extent practicable, these support facilities will be sited within the existing railroad rights-of-way and limited to the minimum space necessary to facilitate safe installation operations. Where support areas are required outside of the existing railroad ROWs, these areas will use state- or municipally owned lands to the extent possible. The selection criteria for these areas will include, but not be limited to: (1) areas of previous disturbance; (2) sites readily accessible to construction operations and for deliveries; and (3) areas where only insignificant impacts are anticipated. Specific locations will be identified during site-specific engineering. These areas will be reviewed for site-specific impacts and appropriate controls, with details to be identified in EM&CP.

1.1.6.2 Underwater Cable Installation Support Facilities

The underwater cables are expected to need very minimal land-based support. Transportation of the cables is expected to be via the cable-laying vessel, supported by re-supply barges operated from an intermittently accessed storage area on land. If land-based support facilities are needed, it is anticipated that any area would be no greater than 200 by 300 feet in size, and would be located at a port with heavy lift facilities. The detailed engineering and construction schedule will identify the need for and the location of these facilities, which will be incorporated into the EM&CP.

1.2 Operations

The Facility is designed to be relatively maintenance free and operate within the specified working conditions. However, the Facility will be periodically inspected to ensure equipment integrity is maintained.

1.2.1 Terrestrial Maintenance

ROW maintenance is necessary to protect the overland cables from altered thermal conditions from tree roots, to maintain the function of permanent stormwater management or access control features, and to replace location and identification markers as necessary. ROW maintenance also serves to identify the area in which the overland cable has been laid and ensure appropriate access to the cable area is maintained in case of emergency. A Long-Range Right-of-Way Management Plan will be provided upon completion of Facility construction.

After construction is complete for the entire length of the transmission line, the Applicants' inspector will inspect the terrestrial ROW once a year and look for:

- Vegetation on the right-of-way that may be capable of disrupting the cables below,
- Line exposures at areas with steep slopes and stream banks,
- Degradation of above ground support structures,
- Locations requiring Facility marker replacement,
- Unauthorized encroachments,
- Permanent stormwater features requiring maintenance, and
- Vandalism.

Most of the vegetation that will be impacted along the overland portions of the ROW consists of previously disturbed herbaceous and/or shrubby cover within the existing railroad ROW. During operations, vegetation management will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the transmission cables and selective cutting to prevent the establishment of large trees directly over the cables. Any vegetation management activities currently conducted by the railroads within the ROW will continue following the construction and operation of the Facility. A Vegetation Management Plan for the operational period will be developed and incorporated into the Long-Range Right-of-Way Management Plan. The goal of the Vegetation Management Plan will be to establish stable low growing vegetation with shallow root systems that will not interfere with the cables and, where the cables will be located within railroad property, will be consistent with the operation and maintenance of the railroads. Impacts related to vegetative maintenance are anticipated to be insignificant.

1.2.2 Underwater Facility Maintenance

For the underwater portion of the route, the entire underwater cables are accessible by either divers or remote operating vehicles, and therefore, inspections will be performed in accordance with manufacturer's specifications in order to ensure equipment integrity and protection (e.g., appropriate burial depths, concrete mats, rip-rap, etc.) is maintained. Additionally, spot checks of the cable protection will be performed during or after the first season. These spot checks will occur more frequently at locations where strong currents are expected or in other areas where abnormalities have been identified (e.g., extreme storm conditions or ice crush outages).

Subsequent to the Facility's commercial operation date, a scan of the installed cable will be conducted using a Time Domain Reflectometer ("TDR") or pulse echo meter and/or an Optical Time Domain Reflectometer ("OTDR"). These scans provide an extremely accurate route location as required by agencies including but not limited to the United States Army Corp of Engineers ("USACE"), the New York State Public Service Commission ("NYSPSC"), New York State Office of General Services, and the United States Coast Guard ("USCG").

1.2.3 Converter Station Maintenance

The converter station will likely be considered "critical infrastructure" and so there will be required security features. Facilities which will be unmanned require, among other potential security measures, intrusion alarms, video cameras both inside the building and overlooking the yard, and cypher locks with SCADA interlocks are provided on the doors. Lighting levels at the converter station will be dictated by the State Energy Code and Illuminating Engineers Association (IEA). Existing standards require general lighting levels of 3-foot candles per SF or less for general site security and up to 5-foot candles at specific locations (entry gate, building entryways and similar location).

Although there are no components of the Facility cable system that require regular replacement, regular inspections in accordance with the manufacturer's specification of terminations and surge arrestors will be performed during scheduled outages to ensure equipment integrity is maintained. For example, insulators will be inspected and cleaned if there are excess deposits of industrial contaminants and soot. Additionally, metal parts, such as nuts, bolts, cable cleats, and grounding scraps will be inspected for corrosion and tightness. The Applicants also anticipate the establishment of a building inspection and maintenance program to ensure the regular upkeep of the Facility and its grounds. This program would include, but not be limited to, landscape maintenance, vegetative management, and the inspection and repair of stormwater systems.

1.2.4 Cable Repair Procedures

While not anticipated, it is possible over the life of the system that the cables may be damaged, either by human activity or natural processes. The owners–operators of the Facility will develop protocols that detail the activities, methods, and equipment involved in repair and maintenance work for the cable system. Although the scope of work for each situation will be adjusted to fit the conditions of the failure, the typical procedure for repair of a failure within the underwater and overland cable installations is described below.

In the event of overland repair, the location of the fault will be identified and crews of qualified repair personnel will be dispatched to the work location. Pre-selected local contractors will excavate around the location of the fault and along the cable for the extent of cable to be replaced. The length of cable replaced for overland failures will be determined on a site-specific basis and designed to avoid or minimize the disturbance to environmental resources while ensuring proper function of the system. Once the portion of the cable that will be replaced is excavated or pulled from HDD conduit, specialized jointing personnel will perform the removal of damaged cable and installation of the new cable section. Once complete, the cable will be re-installed using the same methods as original installation.

In the event of a failure in the underwater portion of the cable, the same basic steps of identifying the location of the fault, de-burial, removal of the damaged section, positioning of the replacement section, jointing and re-burial are still followed. Depending on the location of the fault, the appropriate equipment will be used to perform the necessary work. Appropriate vessels and qualified personnel will be identified prior to a failure to minimize the response time. Once the failure location is identified, a segment of cable equal to approximately 2.5 times the water depth will be excavated in preparation for cable replacement. After the new cable is in place, specialized jointing personnel will install the new section of cable. Once repairs are complete, the cable will be re-buried using similar methods as initial installation.

A goal of the repair protocols is to minimize the outage time from a failure. The repair time will vary depending on the location of the fault, mobilization of specialized equipment and availability of replacement parts, but the majority of repairs will be performed within 14 days.

2.0 LAND USE

This section evaluates existing land uses along and adjacent to the underground portion of the Facility, including the routing and aboveground facilities. This section also evaluates measures to avoid and/or minimize impacts to the natural landscape as well as present or future planned uses. In addition, land use policies for the counties, as well as land use regulations and policies for the individual cities, towns, and villages traversed by the underground portion of the route, have been reviewed and evaluated to determine whether the proposed transmission facilities avoid and/or "minimize conflict with any present or future planned land use." An assessment of the applicability of local ordinances and zoning for each town is provided in Exhibit 7 (Local Ordinances) of the Application (Joint Proposal Exhibit 7), Attachment I of the Supplement (Joint Proposal Exhibit 35), and as part of settlement discussions (Joint Proposal Exhibit 115)..

Section 2.5 provides a brief summary of land use for the underwater portions of the HVDC Transmission System cable route, and discusses the system's consistency with Article 42 of the Executive Law entitled: *Waterfront Revitalization of Coastal Areas and Inland Waterways.* Local municipalities that border coastal areas and inland waterways may voluntarily prepare Local Waterfront Revitalization Plans (LWRP), in conjunction with the New York State Department of State (NYSDOS), for the preservation, enhancement, protection, development, and use of the state's coastal and inland waterways and adjacent waterfront land. Projects that may impact coastal areas or inland waterways must be reviewed for consistency with those LWRPs that pertain to territory within the routing area. This section includes an evaluation of the 22 municipal LWRPs along Facility route, including both the underground and underwater portions of the transmission cable route.

2.1 Existing Land Use

The Facility includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within Lake Champlain, the Hudson River, the Harlem River, and the East River. The majority of the terrestrial portions are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; and (6) the Luyster Creek converter station area in Astoria. From the converter station, two 345 kV HVAC circuits will connect the Luyster Creek converter station to a gas insulated switchgear substation owned or to be owned by the New York Power Authority ("NYPA") and an approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation ("Astoria-Rainey Cable") will be installed. In total, the underground portions of the routing traverse seven counties (Washington, Saratoga, Schenectady, Albany, Greene, Rockland, New York) and 37 cities, towns and villages in New York State. Table 2-1 summarizes the communities that will be traversed by the underground portion of the cable route.

The majority of the underground portion of the Facility route is proposed to be constructed within existing CP and CSX railroad ROWs, with the lower Lake Champlain bypass being located in the Route 22 ROW. For the majority of the underground transmission cables, the Applicants will obtain easements from CP and CSX railroads and permits for occupancy from the New York State Department of Transportation ("NYSDOT") for their existing ROWs. The cables will be outside of these ROWs when it is necessary to cross municipal-owned roadways, to avoid sensitive habitat, or when it is necessary to avoid engineering constraints such as bridge abutments or existing structures. The Facility route will also be outside of any ROW for the installation of the Astoria-Rainey Cable. The Applicants will also use approximately 3.5-acres of the parcel in Astoria where the Luyster Creek converter station will be located.

Existing land use is classified based on review of aerial photographs, site visits to selected locations along the cable route, and resource data from the New York State Geographic Information System (GIS) Clearinghouse (2004) inventories. The study area for land use includes 600 feet on either side of the cable route centerline. Figure 2-1 shows the existing land uses within the study area for the underground portions of the Facility route while Figure 2-2 shows existing land use within 0.5 miles of Luyster Converter Station and Figure 2-3 shows existing land use within 0.5 miles of Astoria-Rainey Cable. Table 2-2A summarizes the current land use in each of the communities along the underground portion of the cable route. Table 2-2B summarizes the percentage of land use class within the total study area. The following sections describe the existing land uses along the cable route and at the aboveground facility locations, by community.

The underwater portion of the HVDC Transmission System cable is located within Lake Champlain, Hudson River, Harlem River, and East River. The transmission cable along these portions of the route will be placed primarily within deep open water areas of these water bodies, and will not conflict with existing navigational, recreational boating, fishing, or other water-dependent uses.

2.1.1 Washington County

The northern portion of the overland routing begins in Washington County at approximately MP 101.5. This portion of the underground cable exits Lake Champlain in the Town of Dresden and enters the Route 22 ROW. The Facility route along the CP railroad ROW begins in the Town of Whitehall at approximate MP 112 and continues southeast through the Towns and Villages of

Fort Ann and Fort Edward to the county line between Washington and Saratoga Counties. For the entire segment, land use is predominantly "transportation" as the railroad and Route 22 ROWs are in use. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

2.1.1.1 Town of Dresden

The cables will exit the waters of Lake Champlain and enter the ROW of Route 22. The Facility route traverses approximately 8.4 miles south through the Town of Dresden until it reaches the Town of Whitehall boundary. Land use adjacent to this segment is primarily forested land with a mix of open land/scrub/shrub (hereafter referred to as "open land"), agriculture, and commercial/industrial/transportation (hereafter referred to as "commercial") land uses dispersed throughout. There are also some small residential areas along this segment, especially off Dresden Road and along Route 22 near Clemons Center Road. The southern most portion of this segment goes through agriculture land. The South Bay State Boat Launch is located off Route 22 just before the route crosses under the South Bay via horizontal direction drilling and then back onto land within the Village of Whitehall.

2.1.1.2 Town/Village of Whitehall

A short segment of the Facility route goes through the Town of Whitehall underwater beneath the South Bay. Land use adjacent to this portion of the cable route is primarily water. Access for recreational fishing associated with the South Bay pier will be maintained as feasible and as construction site safety requirements will allow. The route continues through the Village of Whitehall in a northwest to southeast direction to the Fort Ann town boundary. In Whitehall, the transmission cables switch from the Route 22 ROW to the CP railroad ROW near the intersection of Broadway and Saunders Street. Land use along this segment of the cable route is more developed and consists of mainly commercial/industrial/transportation along the east side of the CP railroad ROW, and residential land to the west. Areas north and south of the downtown are primarily agriculture and forested land, with some residential areas. There are also small areas of commercial and open land use dispersed through this segment.

It has been suggested that the Facility could be laid along the proposed route of the Champlain Canalway Trail within Whitehall from Poultney Avenue to Ryder Road. The proposed trail would be developed along the route of old canal towpath and an option would be to have the post-construction restoration activities facilitate the development of the recreational path in conformance with New York State Open Space Conservation Plan. Land use along this section is primarily forested and agricultural/open space land.

2.1.1.3 Town/Village of Fort Ann

The underground cable route along the CP railroad ROW continues into Fort Ann where land use primarily includes forest and open shrub/scrub/pasture land to the west and east of the railroad ROW, but includes a small section of commercial/industrial/transportation land near Lock C11. East of the construction zone is the Champlain Canal.

2.1.1.4 Town Hartford

The underground cable route along the CP railroad ROW continues into Hartford where land use primarily includes forest and open shrub/scrub/pasture land to the west and the Champlain Canal to the east.

2.1.1.5 Town of Kingsbury

The underground cable route along the CP railroad ROW continues into the Town of Kingsbury to the Fort Edward town line. The primary land use consists of open shrub/scrub/pasture land. There are smaller parcels of agriculture and forest land. Near Route 149, Rabideau and Newton Lanes, there are small residential and commercial/industrial/transportation areas.

2.1.1.6 Town/Village of Fort Edward

The underground cable route along the CP railroad ROW enters the Town of Fort Edward and travels southwest toward the Moreau town line at the Hudson River, where the transmission cable route enters Saratoga County (Figure 2-1). Near the Kingsbury town line the land use is almost entirely open shrub/scrub/pasture land. From north to south, the land use quickly becomes agricultural and then mixes with commercial/industrial/transportation/land use as the route travels further south. Near the Village of Fort Edward, which is crossed in the southwestern portion of the township, the land adjacent to the underground cable route becomes a mix of residential and commercial/industrial/transportation areas, with a few additional small forested areas and open spaces. Just north of the Moreau town line, there is an open space area associated with Rogers Island in the middle of the Hudson River. The portion of the line that crosses the Hudson River from Fort Edward to Rogers Island and then to the Town of Moreau is not underground and, instead, is attached to existing bridge structures.

2.1.2 Saratoga County

In Saratoga County, the underground portion of the Facility route is located on land almost entirely within the CP railroad ROW. The proposed underground cable route crosses through the Towns of Moreau, Northumberland, Wilton and Greenfield, the City of Saratoga Springs and the Towns of Milton, Ballston, and Clifton Park. The portion of the line that crosses the Hudson River in the Town of Moreau is not underground and, instead, is attached to existing bridge structures. For the entire segment, land use is predominantly “transportation” as the railroad ROW is in use. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

2.1.2.1 Town of Moreau

The Facility route crosses the Hudson River (attached to the bridge trestle) and enters the Town of Moreau heading in a southwesterly direction along the CP railroad ROW to the Northumberland town line (Figure 2-1). After crossing the Hudson River from the north, the land use includes a mix of residential, commercial/ industrial/transportation, forest and open scrub/shrub/pasture land. Further south within the Town of Moreau, land use becomes primarily open scrub/shrub/pasture land, with residential areas to the east and along West River Road. In some areas, scrub/shrub/pasture is mixed with forested patches, along with small areas of residential or agricultural land. Land use in the study area near the Northumberland town line is dominated by agricultural land, with some small forested and residential areas off of Mott Road.

2.1.2.2 Town of Northumberland

The cable route enters the Town of Northumberland along the CP railroad ROW and heads in southwesterly direction to the Northumberland-Wilton town line (Figure 2-1). South of the Northumberland-Moreau town line, the land use alternates between open scrub/shrub/pasture land and forested land. Approaching Gansevoort Road from the north, the land becomes a mix of residential and commercial/industrial/transportation. At approximately MP 142 along the transmission cable route, there are two local parks: Bertha E. Smith Town Park to the east of the cable route and Gansevoort Town Park to the west (see Section 2.3.8). South of these parks, the area contains a mixture of forest land, agricultural land, open scrub/shrub/pasture land, residential and commercial/industrial/transportation areas. Near the Northumberland-Wilton town line, the transmission cable route is located within 600 feet of the Fire Pond Tract of the Saratoga County Forest Preserve (see Section 2.3.8), and the land adjacent to the cable route is predominantly forested, with small residential areas at the edge of the study area along Pettis Road.

2.1.2.3 Town of Wilton

The underground transmission cable route enters into the Town of Wilton and heads in a southwesterly direction along the CP railroad ROW to the Wilton-Greenfield town line (Figure 2-1). Between the Wilton-Northumberland town line and Ballard Road, the land use is predominantly forested, with several small residential areas between Pettis Road and Ballard Road. There are also two agricultural areas along the eastern side of the cable route in this area. South of Ballard Road, the cable route abuts several parcels of land that are within the Wilton Wildlife Preserve and Park (see Section 2.3). This area has a mixture of land use types including forest, open scrub/shrub/pasture land, commercial/industrial/transportation areas, and residential areas. Near State Route 50, there is an area of residential land located primarily to the southeast of the underground transmission cable route. Near the Wilton-Greenfield town line, the area adjacent to the cable route consists of a mixture of land uses, including forest, residential and agricultural lands that are interspersed with small commercial/industrial/transportation areas and open scrub/shrub/pasture land. Gaven Park (see Section 2.3.8) is located north of the underground cable route just west of Interstate 87.

2.1.2.4 Town of Greenfield

Within the Town of Greenfield, the proposed transmission cable route follows the existing CP railroad ROW from the Greenfield-Wilton town line in a southwesterly direction towards the City of Saratoga Springs (Figure 2-1). From the Greenfield-Wilton town line to Clinton Street, the majority of the land is forested, with some residential areas to the north and west of Daniels Road. From Clinton Street to the border with the City of Saratoga Springs, the current land use consists of open scrub/shrub/pasture interspersed with residential land along Clinton Street and Denton and Bloomfield Roads.

2.1.2.5 City of Saratoga Springs

Within the City of Saratoga Springs, the proposed transmission cable route follows the existing CP railroad ROW from the Town of Greenfield in a southerly direction to the Ballston town line (Figure 2-1). From the Saratoga Springs-Greenfield town line to State Route 9N, the current land use is primarily forest and open scrub/shrub/pasture land, with areas of commercial/industrial/transportation use along State Route 9N. This section of the study area traverses the eastern edge of the Saratoga Springs Golf and Polo Club. Current land uses between State Route 9N and State Route 29 (Washington Street) include commercial/industrial/transportation, open scrub/shrub/pasture and forest lands that are interspersed with small residential areas south of State Route 9N and north of State Route 29.

South of State Route 29 to County Road 43 (Geyser Road), the land use consists of forests, residential lands, and commercial/industrial/transportation with small areas of open scrub/shrub/pasture land. To the south of County Road 42, land use is primarily forest and open scrub/shrub/pasture land, interspersed with a small residential parcel on the east of the cable route centerline off Belmont Drive. Where the transmission cable route passes between the Saratoga Nursery and the Saratoga Spa State Park, forest is the dominant land use, with some residential and commercial/industrial/transportation areas along State Route 50. As the transmission cable route approaches the Milton town line from the north, the cable route is located in an area that is primarily forest, with several residential and commercial/industrial/transportation areas located along State Route 50 (Ballston Avenue) and a large residential area on Old Ballston Avenue. This section also contains scattered small areas of open scrub/shrub/pasture land.

The NYSDOT has plans for the installation of second rail line between Saratoga Springs and Ballston Spa. The intent of this improvement is to reduce delays and shorten travel time for Amtrak's Adirondack and Ethan Allen Express services. The routing centerline has been shifted to avoid conflicts with planned development of additional trackage and station improvements.

2.1.2.6 Town of Milton

The underground transmission cable in the railroad ROW enters the Town of Milton from the City of Saratoga Springs and travels generally south along the CP railroad ROW to the Milton-Ballston town line (Figure 2-1). Though the underground cable route does not enter the Town of Malta, it does lie near (within 600 feet of) the Malta town line for most of its length within the Town of Milton; therefore, some of the study area is actually within the Town of Malta. From the Milton-Saratoga Springs town line to Malta Avenue, the land use consists primarily of forest land, with residential areas located off of Saratoga Avenue to the north, and along Malta Avenue/County Road 63 to the south. Most of the area south of Malta Avenue to the Ballston town line includes forested land, with some commercial/industrial/transportation use and residential areas directly south of Malta Avenue and off the Columbia Avenue Extension. There are additional residential areas along the western edge of the study area. Between Malta Avenue and the Milton-Malta town line there is one park/recreational use parcel.

2.1.2.7 Town of Ballston

The underground transmission cable route crosses into the Town of Ballston from the Town of Milton and follows the CP railroad ROW in a southerly direction to the Clifton Park town line (Figure 2-1). From the Ballston-Milton town line, the current land use is a mixture of forest land, residential areas, and open scrub/shrub/pasture land, becoming predominantly forested further south until the route reaches State Route 67. There are small residential, agricultural, and open scrub/shrub/pasture land parcels just off State Route 67. Just south of State Route 67, there is an area of mixed forest, open scrub/shrub/pasture and commercial/industrial/transportation land, before the construction zone again becomes primarily forested; however, there are several clusters of small residential and commercial/ industrial/transportation use areas along roads that intersect or pass near the transmission cable construction zone. Along this stretch, the ROW is located to the west of Ballston Lake. At Whites Beach Road, land use becomes a mixture of forest, open scrub/shrub/pasture and residential lands. About a half mile south of Whites Beach Road, land becomes mostly forested. In the area near Route 146A (Midline Road) and the Ballston-Clifton Park town line, the land use is a mixture of commercial/ industrial/transportation use, residential, forest, and open scrub/shrub/pasture land.

The NYSDOT has plans for the installation of second rail line between Saratoga Springs and Ballston Spa. The intent of this improvement is to reduce delays and shorten travel time for Amtrak's Adirondack and Ethan Allen Express services. The route’s centerline has been shifted to avoid conflicts with planned development of additional trackage and station improvements.

2.1.2.8 Town of Clifton Park

The transmission cables enter the Town of Clifton Park from the Town of Ballston and heads in a southwesterly direction within the CP railroad ROW to the Town of Glenville in Schenectady County (Figure 2-1). Between the Clifton Park-Ballston town line and County Road 110 (Blue Barns Road), the current land use is primarily forest and open scrub/shrub/pastureland, with small residential areas off County Road 110 and a narrow corridor of commercial/industrial/transportation use parallel to the cable route. South of County Road 110, land use consists of a mixture of residential, commercial/industrial/transportation, open land, and forest, with land becoming predominantly forested to the south approaching the Glenville town line.

2.1.3 Schenectady County

In Schenectady County, the transmission cable route follows the CP railroad ROW south and west from the Town of Glenville and the City of Schenectady into the Town of Rotterdam. In Rotterdam, the route turns further south to follow the CSX railroad ROW. For the entire segment, land use is predominantly “transportation” as the railroad ROW is in use. The descriptions below provide information on the land cover types adjacent to the proposed cable routing. The portion of the cable system which crosses the Mohawk River at the Town of

Glenville and City of Schenectady are not underground but, instead, is attached to an existing bridge structure.

2.1.3.1 Town of Glenville

The cable route enters the Town of Glenville from Saratoga County and follows the CP railroad ROW to the southwest. The route exits the Town of Glenville by crossing the Mohawk River to the City of Schenectady (Figure 2-1). In general, the transmission cable corridor in the Town of Glenville is chiefly mixed forest and open scrub/shrub/pasture land, with a few small pockets of residential areas off County Road 31 (Hetcheltown Road), County Road 29 (Maple Avenue Extension), and Glenridge Road. There are also two areas shown as parks/open space/recreation. Just north of County Road 16 (Alplaus Avenue), there is an area of commercial/industrial/transportation to the east and a residential area to the west of the transmission cable construction zone. Near the Mohawk River, there are a few areas of commercial/industrial/transportation use off County Road 29 (Maple Avenue) and Freeman Bridge Road.

2.1.3.2 City of Schenectady

The transmission cables crosses the Mohawk River and enters the City of Schenectady, traveling south and west along the CP railroad ROW to the Rotterdam town line (Figure 2-1). Besides a small forested riparian area along the Mohawk River, the area from the river to Bailey Street is mostly commercial/industrial/transportation. At approximately MP 173, the cable route deviates from the CP railroad ROW and continues along Erie Boulevard for approximately 0.6 miles. Land use along this route is also commercial/industrial/transportation. From Bailey Street to the Rotterdam town line, land use is a mixture of commercial/industrial/transportation, residential, forest, and open scrub/shrub/pasture land. The land generally becomes more forested approaching the Schenectady-Rotterdam line. There are two parcels of open space or recreational use land north of the transmission cable route, and Hillhurst Park is located just to the south of the ROW (see Section 2.3.8).

2.1.3.3 Town of Rotterdam

The cable route enters the Town of Rotterdam from the City of Schenectady and follows the CP railroad ROW generally west to the junction with the CSX railroad ROW. From this point, the cable route turns generally south to follow the CSX railroad ROW towards the Guilderland town line (Figure 2-1). Within the Town of Rotterdam north of County Road 89 (West Campbell Road), land use consists of mostly forest and commercial/industrial/transportation use lands. In this area, the transmission cable route passes to the south of the Rotterdam Square Mall. Between County Road 89 the CSX railroad ROW, the north side of the study area has forest, commercial/industrial/transportation use land, a narrow corridor of open scrub/shrub/pasture and a residential area off County Road 83. Along the CSX railroad ROW from the Rotterdam Junction to the rail yard just north of Interstate 90, the primary land use is commercial/industrial/transportation use, with two small residential areas at the junctions Route 387 and County Road 89 and Route 387 and County Road 83 (Princetown Road). The southern portion of the transmission cable route, from the rail yard near Interstate 90 to the Guilderland town line is mostly a mixture of forest, open scrub/shrub/pasture and residential land.

2.1.4 Albany County

The underground transmission cable route enters Albany County along the CSX railroad ROW from Schenectady County and travels generally south through the Towns of Guilderland and New Scotland, the Village of Voorheesville and the Town of Bethlehem. For the entire segment, land use is predominantly "transportation" as the railroad ROWs are in use. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

2.1.4.1 Town of Guilderland

The underground transmission cable route enters the Town of Guilderland from Rotterdam and follows the CSX railroad ROW south to the New Scotland town line (Figure 2-1). From the Guilderland-Rotterdam town line to W. Lydia Street, the current land use consists of primarily forest with some open scrub/shrub/pasture land. From there to Route 20 (Western Turnpike), the east side of the land use study area is mostly forested. The west side of the cable route in this area contains mixed forest, residential, and agricultural land. Between Route 20 and Frenchs Mill Road, the west side of the study area is primarily forested adjacent to the Watervliet Reservoir. To the east, the current land use consists of forested, open scrub/shrub/pasture and residential areas off Fuller Station and Frenchs Mill Roads.

South of the Watervliet Reservoir area, land use is mostly forest, open scrub/shrub/pasture, commercial/industrial/transportation, and smaller areas of residential land. Industrial areas are primarily along the west side of the transmission cable route. Roger Keenholts Park (see Section 2.3.8) is located on the west side of the route to the south of the Watervliet Reservoir. Near County Road 201 (Depot Road), land use is more residential and commercial/industrial, mixed with open scrub/shrub/pasture and agricultural lands, particularly to the east of the route. Near the New Scotland town line, the land becomes predominantly forested.

2.1.4.2 Town of New Scotland and Village of Voorheesville

The underground transmission cable route enters the Town of New Scotland along the CSX railroad ROW from Guilderland, traveling south through the Village of Voorheesville to the Bethlehem town line (Figure 2-1). Several agricultural areas are present near the New Scotland-Guilderland town line. Within the Village of Voorheesville, land is mostly residential, with a few areas of forested, open, and commercial/industrial/transportation use land. The route is near two areas of park, open space, or recreational use, including Jim Nichols Park (see Section 2.3.8). From the southern boundary of Voorheesville to Youmans Road, the current land use consists chiefly of open scrub/shrub/pasture land. Between Youmans Road and Route 85 (New Scotland Road), there are two residential areas separated by forested land and open land. The northern residential area is along Youmans Road and the southern along Route 85. Just south of route 85 on the east side of the cable route is an area of commercial/industrial/transportation use land.

From Route 85 to the Bethlehem town line, land use is a mixture of forest, residential, commercial/industrial/transportation and open scrub/shrub/pasture. Residential areas are located primarily along County Road 308 (New Scotland South Road), Route 443 (Delaware Turnpike), and Waldemaier Road. Commercial/industrial/transportation land is associated with County Road 308, Bluebirds Way, and Game Farm Road. In this portion of the route, the transmission cable route also abuts the Five Rivers Environmental Education Center (see Section 2.2.1).

2.1.4.3 Town of Bethlehem

The cable route enters the Town of Bethlehem along the CSX railroad ROW and follows south to the Bethlehem-Coeymans town line for just a short distance of less than 0.5 mile. Land use adjacent to the route on the east is primarily forested, and land use on the west is residential. There is also an area of commercial land use on the northwest side of the route.

2.1.4.4 Town of Coeymans and Village of Ravena

The cable route continues along the CSX railroad ROW within the Town of Coeymans for about 3 miles south until it reaches the Coeymans-Village of Ravena boundary. Land use adjacent to the northern portion of this segment is residential and forested. Land uses moving south are primarily forested, open land, and commercial.

From the Town of Coeymans, the route enters the Village of Ravena and passes by an expansive industrial land use (Lafarge Cement Plant) on the east side of the route, located just south of the intersection of Kinley Road and US Route 9W. The plant was originated as the Atlantic Cement Company in 1962, but was acquired by Lafarge North America in 2001. The firm is currently seeking permitting to modernize their plant. A review of the Draft Environmental Impact statement (Lafarge, 2011) did not indicate that this planned renovation would have any impact on the routing.

From the Village of Ravena, the CSX railroad ROW continues south for about 1 mile to the Town of New Baltimore boundary. Land use through the village is primarily high density residential. There is a park/open space/recreation (hereafter referred to as “recreation”) area at the northern end of the segment.

2.1.5 Greene County

Within Greene County, the route runs along the CSX railroad ROW through the Town of New Baltimore, Town of Coxsackie, Village of Coxsackie, Town of Athens, Town of Catskill, and Village of Catskill. For the entire segment, land use is predominantly “transportation” as the railroad ROW is in use. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

2.1.5.1 Town of New Baltimore

Within the Town of New Baltimore, the cable route continues along the CSX Railroad ROW south for about 6 miles toward the Town of Coxsackie boundary. Interstate 87 (I-87) generally runs parallel along the east side of the cable route for the northern portion of the segment, and then crosses over the cable route and continues along on the west side. Residential land is located between the cable route and I-87 on the northeastern portion of the segment. Agricultural land is located on the northwestern side of the route. Land use along the remaining stretch of the route heading south is primarily forested and open land, with smaller amounts of commercial, residential, and agriculture land uses. A small portion of an agriculture district overlaps the study area toward the southern end of the segment before crossing into the Town of Coxsackie.

2.1.5.2 Town and Village of Coxsackie

From the Town of New Baltimore, the cable route along the CSX railroad ROW enters the Town of Coxsackie and heads south for about 1 mile, where it passes through the Village of Coxsackie for about 1 mile, and then passes through the Town of Coxsackie again for another 3 miles until it reaches the Town of Athens boundary.

Within the northern portion of this stretch in the Town of Coxsackie, land use is primarily open and forested land use. A small portion of the agriculture district mentioned above extends into the study area. As the route enters the Village of Coxsackie, it passes through some concentrated residential areas in the northern segment. Heading south, adjacent land use is a mix of open land, commercial, and forested areas. As the route continues south through the Town of Coxsackie, adjacent land use is commercial and then the adjacent land use transitions into mainly open land, agriculture, and forested land. The route passes through stretches of large agriculture districts.

2.1.5.3 Town of Athens

From the Town of Coxsackie the cable route continues south through the Town of Athens for a little over 4 miles until it reaches the Town of Catskill boundary. Land use adjacent to this segment is primarily open land, followed by forested land use, and then commercial. As shown in the mapping, there a few small areas of open water within the study area. There do not appear to be any residential areas in this segment. The route passes near several agriculture districts.

2.1.5.4 Town and Village of Catskill

From the Town of Athens, the cable route along the CSX railroad ROW enters the Town of Catskill and heads south for just over 1 mile toward the Village of Catskill. Land use within the Town segment is primarily open land followed by commercial and forested land uses. There is a small percentage of residential and agricultural land use along the route. There is a small area of open water in the study area. The portion of the cable system which crosses the Catskill Creek is not underground but, instead, is attached to an existing bridge structure.

From the Town of Catskill, the route enters the Village and heads south for about 1.5 miles. The Village is more densely developed and land use consists primarily of commercial, followed by open land and some residential areas. There is a small percentage of forested land and open water as well. There is also a recreation area in proximity to the route near the intersection of Willow Lane and Maple Avenue.

The route then heads back through the Town of Catskill. Land use along this stretch is primarily open land with some agriculture and forested areas. The route passes near two agriculture districts. The route also borders the Holcim Fields, which are operated by the Catskill Soccer Club. The ten acres of land, situated along Embought Road off of Route 9W in Catskill north of the Holcim plant entrance, houses space for three soccer fields. The cable route exits the CSX railroad ROW at approximate MP 227.5 and travels east along an existing local roadway before entering the Hudson River via HDD at MP 228.2.

2.1.6 Rockland County

The Haverstraw Bay segment is approximately 7.7 miles, and goes through the Town of Stony Point, Town and Village of Haverstraw, and the Town of Clarkstown, all within Rockland County. Most of Haverstraw Bypass is along CSX railroad ROW except for a small segment in the Village of Haverstraw where it comes off the CSX railroad ROW, travels under Rockland Lake State Park and Hook Mountain State Park to emerge in the Route 9W ROW in Clarkstown. The cables travel within the ROW before being HDDed under the state parks into the Hudson River. For the entire segment, land use is predominantly “transportation” as the railroad ROW is in use, although the southern portion does cross under two State parks. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

Rockland County has been the lead agency in establishing a Quiet Zone along 23 miles of CSX ROW. A quiet zone is a section of rail line that contains one or more consecutive railroad crossings at which locomotive horns are not routinely sounded. Safety improvements will be made at each of these locations. The Facility location and design will avoid conflicts with new safety improvements at public road grade crossings.

2.1.6.1 Town of Stony Point

The cable route comes ashore from the Hudson River and intersects with the CSX railroad ROW within the Town of Stony Point. The route heads south for about 2.5 miles until it reaches the Village of Haverstraw boundary. Land use along this segment is a mix of commercial, residential, open land, and open water, with small areas of forested land.

The route passes through some forested areas and the Stony Point Battle Field State Historical Park on the northern end. Heading south fairly dense residential areas are located west of the route while commercial areas and open water are to the east. There is also a recreation area to east. Continuing south, the residential areas shift further to east of the route. On the southern end of the segment, land use is a mix of open and commercial use before the route passes into the Village of West Haverstraw. The cable route crosses Cedar Brook Pond, before heading south into the Town of Haverstraw for a short distance.

2.1.6.2 Town Haverstraw, Village of West Haverstraw, and Village of Haverstraw

From the Town of Stony Point, the route continues south through the Town of Haverstraw, Village of West Haverstraw, and Village of Haverstraw. Land use along this segment is mostly commercial and residential properties. Land use along the short segment that passes through the

Town is primarily open land. As the route enters the Village of West Haverstraw, land to the west of the route is primarily dense residential areas and land to the east is commercial. There are some residential areas east of the route as it continues south. The route crosses Minisceongo Creek just before it enters the Village of Haverstraw.

Within the Village of Haverstraw, land use is mainly residential, commercial, and forested land. The northern segment is primarily dense residential areas both on the east and west side. There is a small recreational area located west of the route within the residential areas. There is also a pocket of commercial land located on the west side of the route between the residential areas north and south. As the route continues south, land use is residential and commercial on the east side and forested on the west. Haverstraw Beach State Park is located on the east and west side of the route just before the route passes into the Town of Clarkstown. The cables in this area will be installed underground via HDD to Route 9W.

2.1.6.3 Town of Clarkstown

From the Village of Haverstraw, the cables will be installed under Rockland Lake State Park and Hook Mountain State Park to Route 9W. The cables will follow the 9W ROW south approximately 0.6 miles before another HDD is established to transition as a submarine route into the Hudson River. Land use east of the route is residential and west of the route is forested. The cable route goes through Hook Mountain State Park and then transitions as a submarine route into the Hudson River.

2.1.7 New York County

After entering the Hudson River south of Haverstraw Bay, the cables travel approximately 20.7 miles before entering Spuyten Duyvill and the Harlem River. After 6.58 miles within the Harlem River, the cables exit the water and enter a CSX ROW in the Bronx, then travel under the East River to connect with the Luyster Creek converter station site. From the Luyster Creek converter station, an approximately three mile 345-kV HVAC cable will be installed in the roadway to the Rainey substation. For the segment bypassing the East River, land use is predominantly "transportation" as the railroad ROW is in use. At the converter station, land use is commercial. The Astoria-Rainey Cable traverses residential, commercial, and open space. The descriptions below provide information on the land cover types adjacent to the proposed cable routing.

2.1.7.1 New York City

Within New York City, the cable route runs through Manhattan, the Bronx, and Queens for just over 2 miles. Land use adjacent to the route in Manhattan is primarily industrial, commercial, open water (including the Harlem River and Bronx Kill) and recreational land uses. The Bronx is on the northeast side of the cable route, and land use on that side is zoned for industrial use. The route then is buried with the East River and then crosses into Queens onto parcels where the zoned land use is industrial. Figure 2-2 shows existing land use within 0.5 miles of Luyster Converter Station.

Land use adjacent to the Astoria-Rainey Cable is primarily residential, industrial, commercial, and open space (parks and recreation) (Figure 2-3). The New York City Open Assessable Space Information System ("Oasis") database[2] identified the following schools along the route: (1) St. John's Preparatory School, 21-21 21 Avenue, Queens, New York City; (2) Young Women's Leadership School, 23-25 Newtown Avenue, Queens, New York City; and (3) Ideal Islamic School, 32-21 12 Street, Queens, New York City. Oasis also indicates that the route will be located in the vicinity of Ravenswood Library. Because the cables will be buried underground, there will be no long term impact to these facilities and any construction impacts including noise or disruptions to public access will be temporary in nature.

Additional mapping provided by the New York City[3] indicates that Astoria-Rainey Cable route would be located in close proximity to (1) Kid Kracy school at 21-25 21 Avenue, Queens, New York City and PS 122 Mamie Fay School at 21-21 Ditmars Boulevard, Astoria, New York City. Raices Astoria Senior Center (21-12 30 Road) and Engine 262 Fire House (30-89 21 Street) are also near but not along the route. Because the cables will be buried underground, there will be no long term impact to this Facility and any construction impacts including noise or disruptions to public access will be temporary in nature. This dataset does not locate any of the following public facilities directly along the route: (1) EMS station; (2) fire house; (3) police precinct house; (4) hospital; or (5) post office.

Bus route mapping provided by the Metropolitan Transportation Authority[4] indicates that the Astoria-Rainey Cable route will initially run parallel with Bus Route 100 along 20 Avenue from 31 Street to 29 Street. The cable route will then cross four existing bus travel paths along 23 Street before running parallel to Bus Route 102 for three blocks. On 30 Drive the cables will cross over Bus Routes 100 and 69. Along 12 Street, the cables will cross over Bus Route 104. Because the cables will be buried underground, there will be no long term impact to bus routing and any construction impacts will be temporary in nature.

2.2 Consistency with State and Local Land Use Plans and Policies

Local land use plans and policies, including local park lands and recreational area policies, were investigated for the counties, cities, towns, and villages crossed by the underground portion of the cable route. Rockland County has a Master Land Use Plan while Washington, Schenectady, Albany, and Greene Counties do not have Master Land Use Plans. Saratoga County does not have a Master Land Use Plan, but it has a comprehensive *Green Infrastructure Plan* (see Section 2.2.3). New York County has a New York City Comprehensive Waterfront Plan and a New York City Waterfront Revitalization Program (see Section 2.2.8).

Construction and operation of the underground portion of the cable will have an insignificant affect on local or regional land use patterns or land use planning because it is routed within and along existing disturbed railroad and roadway ROWs to the extent possible. The transmission cables will provide a connection of renewable sources of power generation in central and eastern

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2 http://www.oasisnyc.net/map.aspx?zoomto=lot:4008500001
3 http://gis.nyc.gov/doitt/nycitymap/?searchType=AddressSearch&addressNumber=23&street=29%20Street&borough=Queens
4 http://mta.info/nyct/maps/busqns.pdf

Canada and upstate New York to load centers in and around the New York City. A summary of land use planning along the underground portion of the cable route follows:

2.2.1 2009 New York State Open Space Conservation Plan

The *2009 New York State Open Space Conservation Plan* encourages various state and local stakeholders to take advantage of opportunities to implement conservation recommendations as these stakeholders develop strategies for achieving conservation goals. The conservation plan focuses on four major areas: responding to climate change; fostering green, healthy communities; connecting New Yorkers with nature and recreation; and safeguarding the state's natural and cultural heritage. The state conservation goals include measures to protect plant and animal habitats and the State's surface and ground water quality; combat global climate change; maintain an interconnected network of protected lands and waters for wildlife use; improve community quality of life and health; maintain critical natural resource industries; protect hunting, fishing, trapping and wildlife viewing habitats; provide outdoor recreation, open space, and education and research opportunities; and protect and enhance scenic, historic and cultural resources (NYSOSCP 2009). The conservation plan includes a list of over 100 regional priority conservation projects across the State, some of which are in the vicinity of the underground portion of the transmission cable route, as described below.

Conservation projects in Washington County include:

- **Project 67 - Washington County: Washington Co Agriculture Lands:** The OSP expresses concern about the conversion of agricultural lands and the affect of the conversion has on both the farming community and the ecosystem. It advocates for protection of this resource through agriculture easements on existing farm lands;
- **Project 64 - Lake Champlain Watershed:** The OSP details the importance of the shoreline, wetland, watershed natural communities, and important species in this area. It recommends conserving high quality examples of these natural communities and their associated habitat.
- **Project 63 - Washington County**
  Champlain Canal/Hudson River Corridor: From the Town of Waterford to the Town of Whitehall, the Champlain Canal is an underused resource. Most public ownership along its length is under jurisdiction of the Canal Corp. The conservation plan states that additional open space acquisition focus should include the completion of the Canal Recreationway Trail and recreational access.

Conservation projects in Saratoga County include:

- **Project 66 - Saratoga County**

  Karner Blue Butterfly Recovery Units: Three units in the county support the majority of the remaining local populations of state and federally endangered Karner blue butterfly. These areas have been designed as recovery units in a draft state recovery plan and are also sites for recovery goals under the draft federal recovery plan for the species. The conservation plan states that “acquisition and easements will be needed in conjunction with management agreements and other land protection tools to halt the decline of the Karner blue butterfly."

Kayaderosseras and Fish Creek Corridor/Saratoga Lake: These waterbodies are major tributaries of the Hudson River and are important for recreation, fishing and watershed protection, as well as providing wetlands and natural habitat. Increased public access to the creeks and the lake are goals of the surrounding municipalities and Saratoga County's *Green Infrastructure Plan* (see Section 2.2.3). The conservation plan states that protection efforts can be undertaken by state, county and municipal jurisdictions or by other organizations, in the form of either fee or easement acquisitions.

Mid-County Trail System: Saratoga County has a trail system that traverses four towns and a village in the center of Saratoga County and it has the potential to link some of the major residential population centers. The conservation plan states that protection of the wetlands and natural corridors along the trail and establishment of trail linkages into residential areas will advance recreational use and enjoyment.

Agricultural Lands: Throughout Saratoga County, an active farmland conservation easement program has been created with assistance from the County Farmland Preservation and Open Space Fund. Important farmland protection projects have been initiated under the umbrella of a county-wide program (see Section 2.4). The conservation plan states that any reasonably viable farmland under consideration should be protected, whenever possible, by the purchase of an easement rather than fee simple acquisition, in order to enhance future use of the land for agriculture.

Conservation projects in Schenectady County include:

- **Project 54 - Schenectady County**

  Woodlawn Pine Barrens-Wetlands Complex: This area is situated northwest of the Albany Pine Bush Preserve. It includes several remnant features of the once more widely spread pine barren habitat, including sand plain and dune formations, pitch pine-scrub oak barrens and historic Karner blue butterfly occupied habitat. The conservation plan states that this area is outside of the protection area designated by the Albany Pine Bush Commission, but its attributes have been noted to be worthy of protection.

Conservation projects in Albany County include:

- **Project 43 - Albany County and a small portion of eastern Schenectady County**

  Albany Pine Bush: This area supports a unique inland pine barren ecosystem. The Albany Pine Bush Preserve Commission established guidelines for much of this area in their management plan with the main objective of establishing an ecologically viable and manageable preserve.

- **Project 44 - Albany County**

  Black Creek Marsh/Vly Swamp: These adjacent wetland systems are located directly below the Helderberg Escarpment at John Boyd Thacher State Park. They support a significantly high biological diversity, including amphibian species diversity rivaling the

New England region. The area also has multiple-use recreation and is noted by the National Audubon Society as one of the Important Bird Areas in New York State (see Section 8.2.3 for a discussion of Bird Conservation Areas [BCA]). The conservation plan states that certain additional parcels associated with this wetland complex and important buffer areas remain vulnerable to development activity and should be protected. Opportunities for protection should occur before there is residential subdivision and development pressure.

- **Project 46 - Albany County**

  Five Rivers Environmental Education Center: This education center is located between the suburban towns of Bethlehem and New Scotland. The conservation plan states that the entire area surrounding the education center remains vulnerable to subdivision and development activity, therefore opportunities for protection of public access, public use, and buffer areas remain a priority.

- **Project 48 - Albany County**

  Helderberg Escarpment: This escarpment is the most prominent natural feature in Albany County, and is known for its geological and paleontological significance in addition to the outstanding scenic vistas. This area is characterized by karst geology, including cave formations, and is noted by the National Audubon Society as one of the Important Bird Areas in New York State. The conservation plan states that the southern extent of the escarpment is considered to be an integral part of this area and should also be given high priority for protection.

- **Project 38 - Hudson River Corridor Estuary:** This project encompasses a wide range of actions that have been identified in the Hudson River Action Plan. These include the development of trails and public recreational opportunities as well as habitat, watershed tributary and historic resource protection along the entire lower Hudson Corridor.

Conservation projects in Greene County include:

- **Project 38 - Hudson River Corridor Estuary:** This project encompasses a wide range of actions that have been identified in the Hudson River Action Plan. These include the development of trails and public recreational opportunities as well as with habitat, watershed tributary and historic resource protection along the entire lower Hudson Corridor.

Conservation projects in Rockland County include:

- **Project 38 - Hudson River Corridor Estuary:** This project encompasses a wide range of actions that have been identified in the Hudson River Action Plan. These include the development of trails and public recreational opportunities as well as habitat, watershed tributary and historic resource protection along the entire lower Hudson Corridor.
- **Project 32 - Rockland Riverfront Communities/ Palisades Ridge:** This area houses a critical drinking water supply aquifer. It encompasses important wildlife habitat areas, including wetlands, scenic vistas and other critical environmental areas.

Conservation projects in New York County include:

- **Project 9 - New York County**

  Harlem River Waterfront: The conservation plan states that public access objectives for the Harlem River area are to provide pedestrians and cyclists with an opportunity to enjoy both banks of the river with the expansion of waterfront parks and creation of a continuous pathway in the city-wide greenway system.

- **Project 11 - New York County**

  Manhattan Harlem River Greenway: The conservation plan states that four privately owned industrial lots along the Harlem River in the Inwood section of Manhattan would form a waterside promenade allowing fishing access.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, underground portion of the cable route will not affect the goals of the *2009 New York State Open Space Conservation Plan.*

2.2.2 Washington County

Washington County does not have a Comprehensive Plan or Master Plan; however, it does have an *Economic Development Strategic Plan* dated 2007 (Laberge Group 2007), which states that Washington County is committed to developing a prosperous and economically friendly environment while preserving rural qualities that make it unique.

The *Economic Development Strategic Plan* has goals that include:

- Grow the agricultural and forestry industries,
- Foster downtown revitalization,
- Build tourism,
- Provide efficient and cost effective infrastructure and energy, and
- Promote and develop creative economics.

Because the Facility will be constructed almost entirely within the existing disturbed ROWs, will be completely underground except where the cables cross from Rogers Island (where they will be attached to an existing bridge), and will not be visible or encroach on any additional land outside the existing ROW, the underground portion of the cable route as presented in this Application will not affect the goals of the Washington County *Economic Development Strategic Plan*.

2.2.2.1 Town of Dresden

The Town of Dresden also has not adopted a Comprehensive Plan to guide land use planning. However, because the Town lies wholly within the Adirondack Park, its development is within the jurisdiction of the Adirondack Park Agency ("APA"). The APA was created in 1971 by the New York State Legislature to develop long-range land use plans for both public and private lands within the boundary of the Park. In accordance with Section 805 of the Adirondack Park

Agency Act, the Private Land Classifications impacted by the proposed Facility include Rural Use and Resource Management and Dresden also has two areas designated as Hamlet. Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development.

2.2.2.2 Village of Whitehall

The Village of Whitehall has a *Local Waterfront Revitalization Plan* dated 2004 that is considered to be its Comprehensive Plan (Laberge Group 2007). The *Local Waterfront Revitalization Program* is a comprehensive program for assessment of current problems and opportunities and to build a consensus on the desired future of the community's waterfront. The purpose of the *Local Waterfront Revitalization Program* is promotion of economic development and revitalization of the village's waterfront with assurance of protection and beneficial use of waterfront resources.

The Village of Whitehall *Local Waterfront Revitalization Program* has goals that focus primarily on the following topics:

- Increase and improve public access to water resources,
- Stimulate economic development in downtown Whitehall, and
- Protect and enhance natural resources.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the village.

2.2.2.3 Town of Whitehall

The Town of Whitehall has not adopted a Comprehensive Plan to guide land use planning. Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.2.4 Town of Fort Ann

The Town and Village of Fort Ann, New York Joint Community Plan (Public Hearing Draft - February 13, 2008) entitled *Fort Ann: A Beautiful Place at the Crossroads of a Beautiful Region*, has overall goals of preserving the quality of woodlands, water resources and farms, improving the roads and highways, and promoting managed commercial growth compatible with the town.

Goals of the Joint Community Plan include:

- Create a framework that promotes orderly residential and commercial growth without compromising the rural and scenic character of the town,
- Protect and enhance the natural resources and the historic sites within the town,
- Promote development and rehabilitation of the town and village as a desirable commercial and residential location,
- Protect and enhance the quality of the environment within the town, and
- Promote and protect distinctive character within the communities of Fort Ann.

Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.2.5 Village of Fort Ann

The Town and Village of Fort Ann, New York Joint Community Plan (Public Hearing Draft - February 13, 2008) entitled *Fort Ann: A Beautiful Place at the Crossroads of a Beautiful Region* is discussed in Section 2.2.2.4.

In addition, the Village of Fort Ann has adopted *The Fort Ann Streetscape and Waterfront Revitalization Plan*, a Draft Master Plan Report dated April 2008, that presents the community's vision for revitalization of George and Ann Streets, guides the rehabilitation and interpretation of Locks 16, 17, and 18 of the Old Champlain Canal and provides guidance for appropriate water uses adjacent to the Champlain Barge Canal and Halfway Brook waterfront. *The Fort Ann Streetscape and Waterfront Revitalization Plan* recommendations include streetscape and parking improvements, trail projects, parks, buildings for canal history and visitor use, and interpretive areas.

Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the village. See Section 2.5.2 for further discussion of the consistency of the underwater portions of the Facility with LWRPs.

2.2.2.6 Town of Hartford

The Town of Hartford adopted the Comprehensive Plan in September 2010. The Comprehensive Plan provides an inventory of current conditions in the town with analysis of issues affecting the community and outlines future goals and objectives that will move the town towards its desired future. The Comprehensive Plan recommends that utility lines should be placed underground to reduce visual impacts and increase their reliability. The goals of the Comprehensive Plan include:

- Maintain Hartford's traditional settlement pattern of higher-density hamlets surrounded by lower-density rural lands and provide housing that will support a diverse population.

- Maintain a viable agricultural economy.
- Diversify the town's tax base and provide a variety of job opportunities.
- Provide a safe and economical transportation network.
- Have affordable access to state-of-the-art communications throughout the town.
- Reduce the use of and dependence on non-renewable energy sources.
- Ensure adequate public facilities and services to maintain a rural lifestyle for residents and visitors.
- Preserve Hartford's heritage for current and future generations.
- Preserve and protect those areas that are most valuable for agricultural use, as well as wildlife habitat, scenic vistas, and areas that are environmentally sensitive such as wetlands, ridges, steep slopes and streams.

Because the Facility will be constructed almost entirely within existing ROWs, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town. Since the proposed Facility will be completely underground and will not be visible, the Facility is consistent with the goals and recommendations of the Comprehensive Plan.

2.2.2.7 Town of Kingsbury

The Town of Kingsbury has not adopted a Comprehensive Plan to guide land use planning. A Comprehensive Plan draft was developed in 1973 but was not adopted (Laberge Group 2007). Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.2.8 Town of Fort Edward

The Town of Fort Edward adopted the *Town of Fort Edward Master Plan* in May 2002. The overall goal of the *Town of Fort Edward Master Plan* is to create a balance of open space, farmland, and appropriate development. The community is concerned with loss of character as a rural town with open countryside and closely settled villages and hamlets. The *Town of Fort Edward Master Plan* reviews goals including those listed below, and identifies follow-up projects that respond to concerns about open space protection, historic preservation, natural resource protection, and land use regulation updates.

Goals of the *Town of Fort Edward Master Plan* include:

- Protect and enhance lands which are environmentally significant and/or sensitive, and minimize any adverse impacts man-made development may have on land, air, water quality, natural habitats, unique land formations, and scenic resources;
- Preserve and enhance cultural and historic resources that reinforce a sense of identity and assure that new construction and additions to historic areas of the town are compatible with existing historical architecture and layout;
- Conserve important open space lands and allow more intensive use of other parcels of land for residential, commercial, community facilities, and other uses in close proximity to villages and hamlets;

- Preserve and enhance scenic resources within the town including natural and agricultural areas, historical resources, landscaped areas, street trees, and scenic views;
- Enhance economic climate of the town and promote establishment of new business enterprises to improve the overall economic vitality of the area and enhance quality of life for town residences;
- Improve recreational opportunities for citizens through public and private efforts; and
- Encourage existing and future development that complements the existing scenic beauty in the town.

Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is consistent with this plan's concerns about open space protection, historic preservation and natural resource protection and is not anticipated to impact existing or future land uses and planned development.

2.2.2.9 Village of Fort Edward

The Village of Fort Edward's 2006 *Master Plan* takes into account the facts of changing economic conditions, the importance and value of open space, and the needs and desires of a diverse population. The Village of Fort Edward's *Master Plan* reviews goals related to municipal, recreational and community resources; historic and cultural resources; housing; economic development; transportation; and land use and zoning.

Specific goals of the Village of Fort Edward's *Master Plan* include:

- Preserve and enhance historical and cultural resources for the enjoyment of current residents and future generations,
- Preserve and enhance existing residential neighborhoods of the village, and
- Preserve and enhance the existing community character of the village.

Because the Facility will be constructed almost entirely within existing ROWs, will be completely underground except where it crosses the Hudson River on an existing bridge structure, and will not create a visual contrast with existing views or encroach on any additional land outside the existing ROW, the Facility is consistent with the Village of Fort Edward's *Master Plan*'s goals about preservation of historic resources and community character and is not anticipated to impact existing or future land uses and planned development.

2.2.3 Saratoga County

The *Green Infrastructure Plan* for Saratoga County, adopted in November 2006, proposes a plan for a "Green Infrastructure Network" that is designed to protect and promote open space resources through the conservation of "unfragmented areas" of working farm and forest land, connections between natural areas, concentrated areas of historic resources and "Green Infrastructure Gateways." These "Gateways" are planned entrances to the "Green Infrastructure Network" that will serve as a focus area for economic development and tourism. The *Green Infrastructure Plan* outlines four green infrastructure theme areas: (1) Farmland Core Areas, (2) Natural System "Hubs," (3) Greenways and Trail Corridors, and (4) Heritage Hubs.

While the *Green Infrastructure Plan* does not outline any specific goals or recommendations relative to electric transmission projects, one of the major goals addressed in the plan is to prioritize implementation of projects that will not increase fragmentation of farmlands and natural lands and that will preserve existing open space corridors in the landscape. Because the Facility will be constructed almost entirely within an existing railroad ROW, it will not increase the fragmentation of agricultural or natural lands in Saratoga County and will not affect areas designated for the preservation of historic resources.

Based on a review of the *Green Infrastructure Plan* mapping, the Facility traverses a proposed "Core Farm Area" that incorporates southeast Moreau and northeast Northumberland. Animal agriculture is predominant and includes dairy farms, horse boarding and breeding operations, and farms raising animals for meat. Flat valley land and rolling upland hills provide excellent soil for growth of animal feed, including corn, soybeans, and grass for hay. This region also has small-scale horticulture operations and farm stands, providing a variety of fruit, vegetables, animals, and plants. In this region, farms tend to be larger than in other parts of the county. Because the proposed Facility will be located almost entirely within the existing CP railroad right-of way, it will not increase fragmentation of the agricultural landscape in this area. The location of agricultural lands and lands enrolled in an Agricultural District are further described in Section 2.4.

Based on a review of the *Green Infrastructure Plan* mapping, the proposed Facility also traverses proposed "Natural System Hubs" that incorporate northwest Northumberland, southeast Wilton, northwest Saratoga Springs, and southeast Milton. These areas are known as the "Karner Blue Butterfly Recovery Units Natural Hub." Goals within these areas include protection of Karner blue butterfly occupied habitat that already exists and increase the habitat areas and connectivity within the recovery unit boundaries. The proposed Facility does traverse the Wilton Wildlife Preserve and Park. The proposed Facility also traverses the "Greenway Convergence Natural Hub" in eastern Ballston. Because the proposed Facility will be located almost entirely within the existing CP railroad ROW, it will not increase fragmentation of the proposed Natural System Hub in these areas.

For the reasons described above, the proposed Facility is consistent with the goals of the Saratoga County *Green Infrastructure Plan*.

2.2.3.1 Town of Moreau

The Town of Moreau has a *Comprehensive Land Use Plan*, adopted on August 26, 2008, which provides a succinct description of existing conditions, outlines goals and objectives developed through the planning process, and presents findings and conclusions through the evaluation of existing conditions. The *Comprehensive Land Use Plan* recommends specific actions and implementation mechanisms, but does not specifically address or propose any recommendations regarding electric transmission corridors. Specific goals outlined in the *Comprehensive Land Use Plan* include the following:

- Promote development patterns that foster a well-connected community, providing orderly transition from urban to rural land uses, and proactively preserving open space;

- Enhance and revitalize the local economy with maintenance and promotion of an environment that is attractive to current and potential commercial, industrial, and agricultural development;
- Protect natural resources, forests, wetlands, farmlands, waterways, and outstanding scenic resources; and
- Continue to protect and preserve undeveloped open spaces, particularly farmlands and parcels used for or conducive to agriculture.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground except where the cables cross from Rogers Island (where they will be attached to an existing bridge) and will not be visible or encroach on any additional land outside the existing ROW, the Facility is consistent with the goals of the Town of Moreau *Comprehensive Land Use Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.3.2 Town of Northumberland

The *Town of Northumberland 2003 Comprehensive Land Use Plan* is in the form of a Final Draft dated July 2004. The plan was developed with the intent of preserving the agricultural character of the town, fostering a strong farm economy, and preserving open space and viewsheds.

The goals of the *Town of Northumberland 2003 Comprehensive Land Use Plan* include:

- Preserve and encourage agricultural uses within the town;
- Preserve the rural, open-space character of the town;
- Provide for the limited development of modest commercial areas within the town sufficient to meet the needs of residents;
- Preserve and protect unique natural areas and plant and animal communities within the town;
- Preserve and protect water quality of the town's streams, rivers, ponds, and wetlands;
- Improve the visual quality of the town and protection of viewsheds and scenic vistas;
- Preserve and protect existing historic sites and structures; and
- Expand the scope of recreational opportunities available to town residents.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is consistent with the goals of the *Town of Northumberland 2003 Comprehensive Land Use Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.3.3 Town of Wilton

The Town of Wilton *Comprehensive Plan* was adopted December 2, 2004. The plan was developed with the intent of having a desirable mingling of suburban and rural character, emphasizing, valuing, and improving the quality of life in the town, sharing the sense of responsibility for the town's natural, agricultural, open space, and scenic resources, and having an effective balance of commercial and light industrial development.

The goals of the Town of Wilton *Comprehensive Plan* include:

- Create a land use management system that protects and enhances the town's environmental quality, rural and suburban character, and unique resources and features to direct growth that benefits the community;
- Conserve, improve, and protect the town's natural resources and open space including wildlife habitat;
- Provide sufficient opportunities and facilities for both active and passive recreation activities; and
- Recognize and protect historical and other cultural resources as a priority.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is consistent with the goals of the Town of Wilton *Comprehensive Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.3.4 Town of Greenfield

The *Town of Greenfield Comprehensive Plan* was adopted by the Town Board on May 12, 2005. The intention of this plan is to guide future development in the Town of Greenfield while striving to remain a largely rural town with sizeable residential parcels. The applicable goals of the comprehensive plan include:

- Expand the definition of home occupations;
- Create a new zoning map reflective of the Town's vision;
- Prohibit expansion of the existing commercial districts;
- Prohibit the creation of additional or expansion of the existing industrial manufacturing zone;
- Establish a procedure for lot line revisions;
- Establish bike paths to connect the hamlets and parks with one another;
- Protect Kayaderosseras Ridge from visual, drainage, and erosion impacts;
- Develop additional parks, preferably large, town-wide parks; and
- Discourage development of pocket parks.

The *Town of Greenfield Comprehensive Plan* does not address or make any recommendations regarding electric transmission projects. Because the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, will be completely underground and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of the *Town of Greenfield Comprehensive Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.3.5 City of Saratoga Springs

The Saratoga Springs Comprehensive Plan was originally adopted on May 4, 1999, with first amendments adopted November 21, 2000 and a second amendment adopted July 17, 2001. The plan describes the city's goals for land use development, design, and enhancement, and provides the justification for planning and regulatory policies that encourage desired development and efficient growth patterns to maximize the city's social and economic potential. The goals of the comprehensive plan include:

- Enhance the vitality and success of the city's downtown core area;
- Promote a broader mixture of uses in selected areas to encourage social, business and residential interaction and diversity;
- Implement land use and design policies to enhance quality of life, protect sensitive environmental resources, and preserve traditional community character;
- Support the city's sense of history and the "City in the Country" by preserving the quality of cultural and open space resources; and
- Invest in infrastructure improvements and encourage public/private partnerships that support the plan's goals.

Since the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, will be completely underground and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of *The Saratoga Springs Comprehensive Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.3.6 Town of Milton

The Town of Milton has a *Comprehensive Plan 2001* that is dated June 20, 2001. The overall vision of the *Comprehensive Plan 2001* is to maintain Milton's small-town feel. The Town of Milton *Comprehensive Plan 2001* includes the Milton Town Center Master Plan as an appendix.

Primary goals of the *Comprehensive Plan 2001* include:

- Maintain Milton's small-town feel including a small, accessible government, opportunities for nearby passive recreation, and rural character;
- Encourage mixed commercial and residential growth in the compact Milton Town Center;
- Preserve open spaces, farmland, and woodlots in the western part of town - these are key components of the town's rural character;
- Ensure the protection of all of the town's important natural resources especially safeguarding the town's streams and abundant groundwater resources; and
- Continue to develop and expand the town's active and passive recreational resources.

Because the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town. Since the proposed Facility will be completely underground and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of the *Comprehensive Plan 2001*.

2.2.3.7 Town of Ballston

The Town of Ballston adopted a *Final Draft Comprehensive Plan* in December 2005. The plan was developed with the intent of achieving a balance between village, suburban, and rural land use perspectives and protection of the existing quality of life. The *Final Draft Comprehensive*

Plan discusses the use of railroad corridors for the development of recreational trails. The *Final Draft Comprehensive Plan* recommends that any utility facilities be placed in visually unobtrusive locations.

The goals of the Town of Ballston *Final Draft Comprehensive Plan* include:

- Encourage the conservation of farmland and significant open spaces and ensure the long-term viability of agriculture,
- Create a network of open spaces to provide wildlife habitat and potential greenway/recreational trail corridors,
- Expand town's active and passive recreational resources to meet the growing demand for these amenities, and
- Protect and promote the town's significant historic and cultural resources.

Because the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, will be completely underground, and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of the Comprehensive Plan and is not anticipated to impact existing or future land uses and planned development.

2.2.3.8 Town of Clifton Park

The *Town of Clifton Park Comprehensive Plan* was adopted by Town Board Resolution on April 17, 1995 and was amended in 1997, 1999, 2001, 2003, and 2006. The plan was developed to encourage a balance of land uses so that residential and economic vitality can be pursued and the unique rural and historic character of the town can be preserved. The *Town of Clifton Park Comprehensive Plan* seeks to enhance the quality of life for the town residents.

The goals of the *Town of Clifton Park Comprehensive Plan* include:

- Preserve and enhance residential, historic, agricultural and rural nature of the town while encouraging managed economic growth;
- Maintain a continuing planning process for the town with emphasis on quality of life and appropriate balance of land uses;
- Address issues essential to support existing development and encourage future managed growth, while encouraging community diversity and quality of life; and
- Ensure that future development takes into account environmental impacts on the town, especially related to water supply, water quality, open space, scenic viewsheds, and historic preservation.

The Town of Clifton Park adopted an Open Space Plan in 2003. The main open space concepts and goals include protection of wildlife nature preserves and watersheds, a farmland protection program, parkland and ballfields, town-wide trails and pathways, scenic roads, and cultural resources.

Because the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, will be completely underground, and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of the Comprehensive Plan and the

Open Space Plan and is not anticipated to impact existing or future land uses and planned development.

2.2.4 Schenectady County

Schenectady County does not have a Comprehensive Plan or Master Plan. Schenectady County does have a *Schenectady County Agricultural and Farmland Protection Plan* dated September 2002 that recommends goals and actions that promote the maintenance and expansion of lands in active agricultural use in Schenectady County. The plan notes that Schenectady County's proximity to the Capital Region's urban areas presents challenges and opportunities to farms within the County.

Major goals established in the *Schenectady County Agricultural and Farmland Protection Plan* include:

- Retain viable agricultural land resource (prime/important farmland) for agricultural purposes and ensure public policy is protecting, promoting, and sustaining agriculture;
- Diversify and broaden the agriculture economic base and attract new people to farming ventures; and
- Increase public recognition and support of agriculture and foster a better understanding of farm issues by non-farmers.

The proposed Facility, as presented in this Application will not affect the goals of the *Schenectady County Agricultural and Farmland Protection Plan*. The proposed Facility in Schenectady County will be constructed almost entirely within the CP and CSX existing railroad ROWs. The proposed Facility will be completely underground and will not include any visible aboveground structures or encroach on any land outside the existing ROWs. Therefore, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.4.1 Town of Glenville

During 2004, the Town of Glenville developed a *Town of Glenville Town Center Master Plan* and a *Town of Glenville Freeman's Bridge Road Master Plan*. The area of focus for each of these plans is just west of the proposed Facility.

The goals of the *Town of Glenville Town Center Master Plan* include:

- Establish a critical mass of businesses and activity in the Town Center that further establishes the area as the focal point of the town, providing a unique shopping, recreational and cultural experience in the region;
- Provide a traditional pattern of development that supports a diverse range of uses, public spaces and walkways, to give an integrated community center and civil focal point; and
- Develop more efficient circulation patterns and enhance safety and access by providing a multifunctional street system.

The goals of the *Town of Glenville Freeman's Bridge Road Master Plan* include:

- Establish a framework for land use decisions in the study area including identification of areas best suited to various types of land uses, as well as areas to be left undeveloped or developed for recreational purposes;
- Promote a pattern of development that supports and encourages mixed-use and offers a variety of well designed public spaces and walkways streets; and
- Promote vehicular circulation patterns that segregate commercial traffic from local automobile traffic and offer alternative routes that enhance safety by providing walkways, paths, trails, and dedicated street lanes for pedestrians and bicyclists.

The Town of Glenville Open Space Plan, adopted by the Town Board on May 7, 2008, includes goals and objectives such as the protection of natural and cultural features, land use development patterns that are consistent with the carrying capacity of natural resources, water quality, the rural character of western Glenville, buffers between developed areas in eastern Glenville, environmentally sensitive areas, scenic views, key entryways or gateways to the Town of Glenville, and the development of recreational facilities and opportunities.

Because the proposed Facility will be constructed almost entirely within the existing CP railroad ROW, will be completely underground except where the cables cross the Mohawk River (where they will be attached to an existing bridge), and will not be visible or encroach on any land outside the existing ROW, the Facility is consistent with the goals of the Open Space Plan and is not anticipated to impact existing or future land uses and planned development. The proposed Facility is not located in the areas addressed by the *Town of Glenville Town Center Master Plan* and the *Town of Glenville Freeman's Bridge Road Master Plan*.

2.2.4.2 City of Schenectady

The *City of Schenectady Comprehensive Plan 2020* was adopted by the city council on March 24, 2008. The plan outlines an overall vision for future conservation and development of the city. Four vision elements frame the goals and action plan for the next 15 years: quality city services efficiently delivered; great homes in safe and stable neighborhoods; a beautiful, clean, and green community; and a quality workforce and growing businesses.

The goals of the *City of Schenectady Comprehensive Plan 2020* include:

- Protect and promote historic resources;
- Protect sensitive natural, scenic and environmental areas and permanently preserve open spaces;
- Develop and maintain excellent park and recreation resources; and
- Employ best practices and creative land use tools to shape development, improve design and aesthetics, preserve historic resources, and enhance urban character.

Since the proposed Facility will be constructed almost entirely within the existing CP railroad ROW or existing streets, will be completely underground except where the cables cross the Mohawk River (where they will be attached to an existing bridge), and will not create a visual contrast or encroach on any land outside the existing ROW, the proposed Facility is consistent with the goals of the *City of Schenectady Comprehensive Plan 2020* and is not anticipated to impact existing or future land uses and planned development.

2.2.4.3 Town of Rotterdam

The Town of Rotterdam Comprehensive Plan and Final Generic Environmental Impact Statement was adopted by the Town of Rotterdam Town Board on December 5, 2001. The main objective of the comprehensive plan is to preserve the town's character and identity while allowing for environmentally sound growth and development.

The goals of *The Town of Rotterdam Comprehensive Plan and Final Generic Environmental Impact Statement* include:

- Protect critical sensitive areas, maintain water quality, and conserve land, air, water and energy resources by taking advantage of existing plans or ongoing planning activities such as watershed management plans and regional and local transportation plans;
- Encourage responsible development that limits noise pollution and traffic congestion, provides pedestrian safety, discourages growth in environmentally sensitive areas, protects cultural resources, and provides quality community design;
- Encourage local involvement in community actions; and
- Enhance opportunities for recreational and cultural activities.

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is consistent with the goals of the *Town of Rotterdam Comprehensive Plan and Final Generic Environmental Impact Statement* and is not anticipated to impact existing or future land uses and planned development.

2.2.5 Albany County

Albany County does not have a Comprehensive Plan or Master Plan. Albany County does have an *Albany County Agricultural and Farmland Protection Plan* dated 2004 that details ways to support farming and enhance agriculture in the county. The plan establishes a comprehensive strategy and presents ways that can be used at the private, town and county level to meet the goals for agricultural and farmland protection.

Major goals established in the *Albany County Agricultural and Farmland Protection Plan* include:

- Retain viable agricultural land resources for agricultural purposes;
- Increase marketing opportunities, competitiveness and profitability of farming and the agriculture industry in Albany County; and
- Increase public recognition of the value of agriculture and farmland in Albany County.

The proposed Facility will not affect the goals of the *Albany County Agricultural and Farmland Protection Plan*. The proposed Facility in Albany County will be constructed almost entirely within an existing CSX ROW. The proposed Facility will be completely underground and will not be visible or encroach on any land outside the existing ROW and is not anticipated to impact existing or future land uses and planned development.

2.2.5.1 Town of Guilderland

The *Town of Guilderland Comprehensive Plan 2000* is dated August 7, 2001. The plan outlines the town's vision of itself as a distinctive suburban and rural community in the Capital District. Goals associated with the plan cover topics including: growth management; transportation and mobility; public utilities; business, employment and fiscal resources; housing; town character; agriculture; natural resources and open space; cultural resources; recreation; governance; and implementation.

The goals of *Town of Guilderland Comprehensive Plan 2000* include:

- Create a land use pattern and management system that remediates adverse impacts of sprawl, discourages further sprawl, responds to community needs, and protects and enhances the town's resources, unique features, and quality of life.
- Preserve and enhance the town's identity, image, and quality of life, and maintain and strengthen the distinction between the town's developed and rural/natural areas.
- Protect important agricultural, natural, and open space resources, which contribute to the diversity, character, aesthetics, economy, and general health and welfare of the town.
- Recognize the town's historic resources and preserve and enhance cultural opportunities in the community.
- Provide sufficient, well-located and affordable, active and passive recreational opportunities for all town residents.

The Rural Guilderland: Open Space and Farmland Protection Plan, dated July 2005, details that rural Guilderland is valued for the beautiful farmland, countryside and a natural setting that distinguish it from the town's more urbanized eastern area. A portion of the proposed Facility is located in rural Guilderland. The vision statement notes that the existing character of rural Guilderland should be maintained to the highest extent possible. Further, it is noted that farms, hamlets, and traditional-style development should be interspersed throughout the natural foundation.

The Rural Guilderland: Open Space and Farmland Protection Plan's concepts for conservation include:

- Protect significant natural resources,
- Protect agricultural heritage,
- Respect scenic roads, and
- Protect cultural and historic heritage.

The Rural Guilderland: Open Space and Farmland Protection Plan's concepts for development include:

- Create a rural greenway and rail system,
- Preserve rural hamlets and enhance gateways,

- Maintain roadside rural character, and
- Allow for limited new development that is consistent with the rural character of the town.

The *Route 20 Land Use and Transportation Study-Towns of Guilderland and Princeton, New York*, dated November 2008, examines future land use and transportation along a 4-mile segment of Route 20 located northwest of the proposed Facility between the northern end of the Watervliet Reservoir and Gifford Hamlet. A section of the proposed Facility crosses the Route 20 corridor in proximity of the southeastern end of the Watervliet Reservoir. Goals of the *Route 20 Land Use and Transportation Study-Towns of Guilderland and Princeton, New York* include improving the transportation function and safety of the corridor and improving its aesthetics and economic potential.

In 2007 the Town of Guilderland developed the *Guilderland Hamlet Neighborhood Plan*, but the area of focus for this plan is outside of the proposed Facility area.

Because the proposed Facility will be constructed almost entirely within an existing CSX railroad ROW, it is not anticipated to impact existing or future land uses and planned development in the Town of Guilderland. The proposed Facility will be completely underground and will not be visible or encroach on any land outside the existing ROW. Thus, the proposed Facility is consistent with goals set forth in the *Town of Guilderland Comprehensive Plan 2000.*

2.2.5.2 Town of New Scotland

The Town of New Scotland *Comprehensive Land Use Plan and Generic Environmental Impact Statement* is dated May 1994. The plan outlines a program to provide orderly but limited growth and also retain the basic character of the community. The plan encourages preservation of environmental and cultural resources and also provides a basis from which to draw a capital improvements plan.

The goals of the Town of New Scotland *Comprehensive Land Use Plan and Generic Environmental Impact Statement* include:

- Protect and enhance the current town character and high quality environment while accommodating a mix of residential, commercial, light industrial/manufacturing, agricultural, and office uses;
- Improve the local economy and tax base by encouraging economic development and expand clean light industrial/manufacturing, commercial and office activities and jobs in balance with New Scotland's existing character; and
- Promote a pattern of land use that provides sufficient space for activities of town residents while supporting efficient delivery of services and protection of existing neighborhoods.

Because the proposed Facility will be constructed almost entirely within the CSX existing railroad ROW, will be completely underground, and will not be visible or encroach on any land outside the existing ROW, the Project is consistent with the goals of the Town of New Scotland *Comprehensive Land Use Plan and Generic Environmental Impact Statement* and is not anticipated to impact existing or future land uses and planned development.

2.2.5.3 Voorheesville Village

Voorheesville Village has not developed a Comprehensive Plan. Since the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the village.

2.2.5.4 Town of Bethlehem

The Town of Bethlehem adopted the *Town of Bethlehem Comprehensive Plan and Generic Environmental Impact Statement* on August 24, 2005. The plan was developed with the intent of achieving a balance between urban, suburban, and rural land use perspectives; a balance between the need and desire for economic growth, for tax base expansion and diversification, and for stewardship of finite environmental resources and land; and a balance between short-term and long-term health, safety, and welfare of the community. The *Town of Bethlehem Comprehensive Plan and Generic Environmental Impact Statement* discusses the use of railroad corridors for the development of recreational trail networks. The *Town of Bethlehem Comprehensive Plan and Generic Environmental Impact Statement* recommends that any utility facilities be placed in visually unobtrusive locations.

The goals of the *Town of Bethlehem Comprehensive Plan and Generic Environmental Impact Statement* include:

- Encourage compact, mixed-use commercial and residential development/redevelopment;
- Expand public, private or non-profit active and passive recreational resources and community services available in town;
- Manage and protect significant environmental systems;
- Promote commercial and industrial growth in specifically designated locations;
- Promote energy efficiency and conservation and the use of renewable energy in the town;
- Recognize the town’s significant cultural resources, historic resources, and natural resources; and
- Utilize flexible land use regulations and creative land development techniques to retain the economic value of rural land.

Since the proposed Facility will be constructed almost entirely within an existing CSX railroad ROW, will be completely underground and will not encroach on any land outside the existing ROW or be visible, the Facility is consistent with the goals of the Comprehensive Plan and is not anticipated to impact existing or future land uses and planned development.

2.2.5.5 Village of Ravena

The Village of Ravena has not adopted a Comprehensive Plan to guide land use planning. Because the underground portion of the Facility will be constructed mostly within the existing CSX railroad ROW, will be completely underground and will not encroach on any land outside the existing ROW or be visible, it is anticipated that the Facility will not impact existing or future land uses and planned development in the village.

2.2.6 Greene County

Greene County does not have an overall Comprehensive or Master Plan. The County does have an Open Space and Recreation Plan (2002), an Agricultural Development and Farmland Protection Plan (2002), a Comprehensive Economic Development Plan (2007) and a Hudson River Corridor Study (2008). This last document includes all of the communities affected by the Facility and is designed to articulate a shared regional vision for goals and future growth. Since the proposed Facility will be constructed almost entirely within an existing CSX railroad ROW, will be completely underground and will not encroach on any additional land outside the existing ROW or create a visual contrast, the Facility is consistent with the goals of the above plans and Study.

2.2.6.1 New Baltimore

The Town of New Baltimore *Comprehensive Plan* was adopted March 12, 2007. The plan was developed with the intent of preserving the rural, historic character of the town, promoting and preserving agriculture, and preserving natural resources and promoting business development that is consistent with these objectives. The goals of the *Comprehensive Plan* include:

- Preserve and protect the rural character and environmental quality of the town.
- Promote and encourage business development that is consistent with the rural and historic character of the town and that contributes to the town tax base.
- Promote agriculture and protect farmland by recognizing the unique role that agriculture can play in supporting economic prosperity and protecting the things that make New Baltimore special.
- Advance the administration and understanding of local laws and ordinances.

Because the proposed Facility will be constructed primarily within the existing CSX railroad ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town. Since the proposed Facility will be completely underground and will not be visible, the Facility is consistent with the goals of the 2007 *Comprehensive Plan*.

2.2.6.2 Coxsackie, Town and Village

The Town and Village of Coxsackie joint *Community Plan* was adopted by the town on May 28, 2008 and the village on May 29, 2008. The plan was developed with the intent to protect and preserve open space, natural resources, a rural landscape, and historic districts and structures, while promoting slow to moderate commercial/industrial development. The plan emphasizes smart growth and encourages development that serves the economy, community, and the environment. The goals of the plan are:

- <u>Community Character and Historic Preservation</u> - The Town and Village will employ best practices and creative land use tools that shape development, improve design and aesthetics, preserve historic resources, and enhance rural character.
- <u>Community Stewardship and Planning</u> - The Town and Village will provide strong financial stewardship, municipal leadership and visionary and proactive planning in a framework of

open government that encourages the involvement of residents and leads to a stable and diverse tax base.

- Economic Development and Village Vitality - The Town and Village will create work and wealth for local residents by recruiting compatible new companies, supporting business expansion, and creating a thriving retail center. The focus will be on stimulating a thriving local economy and a vibrant Village core.
- Environmental Resources and Open Space - The Town and Village will protect sensitive natural, scenic, and environmental areas and pursue permanent preservation of open spaces that are essential to maintaining our distinct character and rich quality of life.
- Transportation - The Town and Village will ensure that excellent transportation amenities are accessible to pedestrians, bicyclists, drivers, and public transit users, creating a multi-modal community with well-maintained roadways, manageable traffic, and beautiful streetscapes.
- Infrastructure - The Town and Village will provide well-maintained municipal infrastructure with adequate capacity that provides quality drinking water, and safe waste management. When we supply new infrastructure it will be consistent with land use goals and financially supported by development fees.
- Community Facilities and Recreation - The Town and Village will develop and maintain excellent park and recreation resources, support schools of distinction, and encourage the creation of diverse community programs for all community members.
- Housing - The Town and Village will encourage diversified homeownership of high quality to meet all phases of a family life-cycle including starter houses, family residences, and vacation or retirement homes. New residential clusters will be designed to conserve open space consistent with our land use goals.
- Agriculture - The Town and Village will encourage agriculture and protect farmland by recognizing the vital role farmer's play in protecting our community's character. Creative efforts to sustain the economic viability of farming including outlets for local products will be supported.

Since the proposed Facility will be constructed primarily within the existing CSX railroad ROW, will be completely underground and will not be visible, the Facility is consistent with the goals of *Community Plan* and is not anticipated to impact existing or future land uses and planned development.

2.2.6.3 Athens, Town and Village

The Town and Village of Athens adopted the *Comprehensive Plan* in September 2007. The plan was developed with the intent to protect open space, natural resources, agriculture, and the historic character of the town, while promoting economic development. The goals of the plan are:

- Economic Development - Foster a business-friendly environment, a range of employment opportunities, and a viable regional tourism economy; protect and carefully develop the Hudson River waterfront ; encourage the downtown shopping area to become a mixed residential and commercial district; and encourage the continued growth and improvement of a range of services along Route 9-W.

- Open Space, Environmental, Natural Resources, and Scenic Views - Assess, protect, and enhance natural resources and scenic views.
- Agriculture - Promote agriculturally related businesses, protect and enhance productive or potentially productive farmlands, and promote community awareness of the importance of agriculture.
- Transportation and Pedestrian - Foster a safe and efficient transportation network that encompasses modes of transportation other than automobiles and maintain and enhance residential streets, sidewalks, bike trails, pathways, and state and local roads.
- Historic, Cultural, and Recreational Resources - Enhance access to the Hudson River, preserve historic residential and commercial structures, and ensure year-round recreational and cultural activities.
- Housing - Promote a mix of housing options, promote rehabilitation and maintenance of historic structures, and promote construction of new housing that reflects the town's character.
- Municipal and Community Resources - Promote infrastructure and services to meet needs of residents, promote public protection and fire safety infrastructure, foster proactive municipal planning, and promote the community's educational resources.

Because the proposed Facility will be constructed primarily within the existing CSX railroad ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town. Since the proposed Facility will be completely underground and will not be visible, the Facility is consistent with the goals of the *Comprehensive Plan*.

2.2.6.4 Catskill, Town and Village

The town and village *Joint Comprehensive Plan* was adopted by the town and village on February 5, 2008. The plan outlines a program to preserve the rural character of the town, create a diversity of economic, recreational, and housing opportunities for people at all stages of their lives, and to thoughtfully plan the location of neighborhoods, commerce, and industry, so as to create a healthy balance between the built and natural environments. The goals of the plan are:

- Protection of rural beauty and natural environment
- Enhancement of a vibrant, walkable and historic village core
- Strengthened system of pedestrian-friendly hamlet centers and commercial areas that serve as community focal points
- Preservation of farming and enrichment of the rural economy
- Residential, commercial and industrial growth that respect that rural beauty, historic character and the natural environment of both the village and town
- Greater range of job opportunities
- An efficient system of infrastructure and public services that support community goals
- Effective code enforcement
- A town and village working together to efficiently raise the quality of life for all
- Preservation of historic assets and cultural heritage

Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground except where attached with conduits to an existing bridge structure, and will not create a visual contrast or encroach on any additional land outside the existing ROW, it is consistent with the goals of the *Joint Comprehensive Plan* and is not anticipated to impact existing or future land uses and planned development.

In addition, the Village of Catskill has a *Downtown and Waterfront Revitalization Strategy*. The Strategy identifies efforts to improve the physical condition of the downtown while maintaining its historic quality, link the downtown to the proposed waterfront improvements, and launch a targeted marketing effort to recruit tourist-based businesses that also appeals to the local population. Although the CSX railroad crossing of Catskill Creek is included in the *Phase 1 Summary Report* study area, the Strategy does not identify any proposed improvements for this area. Because the Facility will be constructed underground and will not be visible, it is therefore consistent with the redevelopment objectives of the Strategy.

2.2.7 Rockland County

Rockland County adopted its comprehensive plan, *Rockland Tomorrow: Rockland County Comprehensive Plan*, on March 1, 2011. The Plan addresses the redevelopment pressures and demographic changes that may fundamentally alter the character of the county, including issues of affordable housing, jobs, traffic congestion, preservation of natural and scenic qualities of the Hudson River and county, provision of adequate infrastructure, and preservation of open space and other environmental resources.

Recommendations regarding infrastructure include:

- Using County or municipal GIS systems, consider developing an inventory of gas and electric transmission rights-of-way and utility easements to assist towns and villages in planning and review of development adjacent to these facilities.
- Take the lead in encouraging communication and coordination between utility and highway companies, and in developing a "master schedule" for the permitting and notification process on major projects.

Since the proposed Facility will be constructed primarily within an existing CSX railroad ROW and will be completely underground and, therefore, not visible or result in any changes in land use, the Facility is consistent with the goals of the Plan and is not anticipated to impact existing or future land uses and planned development.

2.2.7.1 Town of Stony Point

The Town of Stony Point is currently in the process of drafting a Comprehensive Plan. Since the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.7.2 Town of Haverstraw

The Town of Haverstraw has not adopted a Comprehensive Plan to guide land use planning. Since the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.7.3 Village of Haverstraw

The Village of Haverstraw adopted a *Master Plan and Zoning Plan* on June 21, 1993. The Master Plan provides background studies, land use maps, and development policies, and describes proposed changes to the zoning ordinance and zoning map. The major land use policies and criteria include a requirement for electric power lines to be underground in all land developments as required by State law. Since the proposed Facility will be constructed primarily within an existing CSX railroad ROW, will be completely underground, and will not be visible, the Facility is consistent with the Master Plan and is not anticipated to impact existing or future land uses and planned development.

2.2.7.4 Village of West Haverstraw

The Village of West Haverstraw has yet not adopted a Comprehensive Plan to guide land use planning. Because the Facility will be constructed almost entirely within the existing ROWs, will be completely underground and will not be visible or encroach on any additional land outside the existing ROW, it is anticipated that the Facility will not impact existing or future land uses and planned development in the town.

2.2.7.5 Town of Clarkstown

The Town of Clarkstown's *Comprehensive Plan* was adopted November 24, 2009, which provides a description of existing conditions, outlines goals and objectives developed through the planning process, and recommends implementation actions. The *Comprehensive Plan* does not specifically address or propose any recommendations regarding electric transmission corridors. The goals of the plan are:

- <u>Economic Development</u> - Apply zoning changes to create and expand commercial and industrial development in appropriate areas; enhance communication between the town and the business community; continue the Economic Development Office to attract new businesses and assist established businesses; ensure that a variety of housing options exists; create connections between the commercial sector and educational institutions; and implement new programs and continue those already in place that beautify the town.
- <u>Environmental Resources</u> - Protect sensitive environmental areas, natural resources, farmlands, ridgelines, and views of wooded and natural areas; implement programs, standards, or regulations for stormwater, erosion and sediment control, wetland protection, airborne pollutants, species of concern, critical environmental areas, noise, dust, odor, and environmentally sound building design; and preserve the suburban and remaining semi-rural character of the town.

- Health, Safety & Welfare - Ensure the efficient provision of emergency services; ensure that building and fire codes are current and enforced; and develop zoning and building regulations that reduce drainage and flooding problems resulting from new construction, reduce negative environmental impacts on residential areas, and encourage and protect the safety of pedestrian and bicycle traffic.
- Historic & Cultural Resources - Identify and maintain an up-to-date inventory of historic resources; protect historic properties from demolition or renovations that would result in loss of historic status; improve maintenance of publically owned historic buildings and cemeteries; and create a plan to communicate with and educate residents regarding historic and cultural resources.
- Housing - Promote affordable housing; expand initiatives to safeguard neighborhoods from inappropriately scaled development; and implement programs which require and/or encourage environmentally sound building design.
- Recreation, Parks & Open Space - Upgrade existing recreational land; construct a multi-use, domed sport and recreational facility; construct a regulation sized ice rink; develop trails; and continue acquisition of open space.
- Transportation - Provide safe and efficient travel through town; provide local public transportation services that promote sustainable travel options; provide for commuter transit services that are accessible, efficient, and safe; create accessible, safe, and enjoyable walking and bicycling environments; and develop Hamlet Centers with transportation options and connections.

Since the proposed Facility will be constructed primarily within the existing Route 9W ROW or buried with an HDD installation and therefore completely underground and not visible, the Facility is consistent with the goals of the *Comprehensive Plan* and is not anticipated to impact existing or future land uses and planned development. When entering the Hudson River, HDD installation will be used to avoid disturbing the shoreline area. The HDD is expected to exit the water at a depth sufficient to avoid and/or minimize impacts to intertidal and nearshore areas.

2.2.8 New York County

The proposed Hell Gate Bypass, Luyster Creek converter station site and the Rainey substation interconnection have been evaluated with respect to consistency with the land use goals and objectives of the:

- *New York City Comprehensive Waterfront Plan*
- *New York City Waterfront Revitalization Program*

2.2.8.1 New York City

New York City Comprehensive Waterfront Plan

The *New York City Comprehensive Waterfront Plan* proposed by the Department of City Planning provides a framework to guide land use along the city's entire 578-mile shoreline in a way that recognizes its value as a natural resource and celebrates its diversity. The plan presents a long-range vision that balances the needs of environmentally sensitive areas and the working port with opportunities for waterside public access, open space, housing, and commercial activity. The *New York City Comprehensive Waterfront Plan* identifies the following planning goals with respect to redeveloping the waterfront:

- Promote economic development and enhance the city's tax base by providing opportunities for new uses, including housing for a range of income groups;
- Enliven the waterfront by promoting people-attracting uses, open space, and public access to the waterfront;
- Integrate new development with adjacent upland communities;
- Consider land use, availability of services and infrastructure capacity in determining scale of redevelopment; and
- Promote social and economic diversity on the waterfront.

On March 14, 2011, the City of New York released “Vision 2020: New York City Comprehensive Waterfront Plan”, which presents policy goals related to City's 520 miles of shoreline (NYCDEP, 2011). The plan includes city-wide strategies, such as expanding public access and enlivening the waterfront, as well as neighborhood strategies. In terms of areas where the transmission cables and converter station would be located, the goals of note are as follows:

South Bronx

No specific new measures or goals are identified along the Hell Gate Bypass transmission line route, although enhancing the Bronx Kill habitat and small craft navigability are noted goals.

Queens

In the discussion of potential projects in the Upper East River, the plan states that efforts should be made to “explore street and public access to [Luyster] creek from 19th avenue.” More generally, the plan states that the City should continue to implement the Queens East River and North Shore Greenway Plan, explore additional locations to provide signage, and to improve connections between upland neighborhoods and existing publicly accessible waterfront sites with consideration for public safety and security.

While the Facility will not, in and of itself, meet any of these objectives, the Applicants believe there is sufficient space available to locate the converter station so as to not interfere with any of these goals.

<u>New York City Waterfront Revitalization Program</u>

The *New York City Waterfront Revitalization Program* is the city's principal coastal zone management tool. As originally adopted in 1982, this LWRP establishes the city's policies for development and use of the waterfront and provides the framework for evaluating the consistency of all discretionary actions in the coastal zone with those policies. The guiding principle of the LWRP is to maximize the benefits derived from economic development, environmental preservation, and public use of the waterfront, while minimizing the conflicts among these objectives.

Through individual project review, the LWRP aims to promote activities appropriate to various waterfront locations. The program is designed to coordinate activities and decisions affecting the coast when there are overlapping jurisdictions or multiple discretionary actions. When a proposed project is located within the coastal zone and requires a local, state, or federal discretionary action, a determination of the project's consistency with the policies and intent of the LWRP will be made.

See Section 2.5.2 for further discussion of the consistency of the Facility with LWRPs, including a specific discussion of the applicability of the New York City LWRP's 10 policies. The work along the Hell Gate Bypass route, Luyster Creek converter station and Rainey substation interconnection is consistent with the goals and objectives of the *New York City Waterfront Revitalization Plan*.

2.3 State and Local Parks/Public Lands

The underground portion of the transmission cable route is adjacent to the following state-maintained parks/public land areas:

- Adirondack State Park;
- Wilton Wildlife Preserve and Park, in the Town of Wilton;
- Saratoga Spa State Park, in the City of Saratoga Springs;
- New York State Department of Environmental Conservation (NYSDEC) Saratoga Nursery, in the City of Saratoga Springs;
- Five Rivers Environmental Education Center, in the Town of New Scotland;
- Stony Point Battlefield State Historic Site
- Hook Mountain State Park; and
- Rockland Lake State Park

2.3.1 Adirondack State Park

The Adirondack Park, created in 1892, contains six million acres of public and private lands, making it the largest publicly protected land in the contiguous United States. The park was created with the goal of protecting water and timber resources of the region at a time when forest clearing was common. The park encompasses over 3,000 lakes, 30,000 miles of rivers and streams, and a wide array of habitat types (NYSDEC 2011a). Within the Adirondack Park, the Adirondack Forest Preserve covers the 2.6 million acres of state land open to the public (NYSDEC 2011b). In addition, the Adirondack Forest Preserve was declared "forever wild" by Article XIV of the New York State Constitution, thus receiving recognition for exceptional scenic, recreational, and ecological significance (NYSDEC 2011b). Forestry, agriculture, residential, and open space land uses comprise the remaining private lands (NYSAPA 2003).

The terrestrial portion of the reconfigured route abuts the Adirondack Park. Because the cables in this area will be underground and almost entirely within the existing Route 22 road ROW, there will be no long term aesthetic impact or impacts to the public use and enjoyment of the park. Any construction impacts including noise or temporary impacts to traffic flow will be short term.

2.3.2 Wilton Wildlife Preserve & Park

The mission of the Wilton Wildlife Preserve & Park is to conserve ecological systems and natural settings, while providing opportunities for environmental education and recreational experiences. The Wilton Wildlife Preserve & Park represents a partnership between the Town of Wilton, The Nature Conservancy, and the NYSDEC. Created in 1996, its goals are to protect and restore the endangered Karner blue butterfly, preserve open space, and provide recreational and environmental education opportunities. The goal of the Wilton Wildlife Preserve and Park is to protect 3,000 acres of land for these purposes. Efforts to achieve these goals are occurring east of Interstate (I)-87 from the Ballard Road area in the north to south of King Road in the south. Within this area, 10 parcels encompassing approximately 800 acres are currently protected. Four of the protected parcels are developed with trails for passive recreation uses (Wilton Wildlife Preserve & Park, 2010).

The underground transmission cable route abuts several of the parcels of the Wilton Wildlife Preserve & Park. Because the cables in this area will be underground almost entirely within the CP existing ROW, there will be no long-term aesthetic impact or impacts to the public use and enjoyment of the preserve. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.3 Saratoga Spa State Park

Saratoga Spa State Park is a 2,200-acre park that surrounds mineral springs at the edge of the Adirondack Mountains. For centuries, the springs in the area were visited for their perceived healing power. By the beginning of the twentieth century, commercial pumping wells had lowered the water table so much that New York State enacted laws that limited the amount of pumping. In 1912, the state took ownership of the land and created a state reservation. Franklin Roosevelt, former Governor of New York, commissioned an architect to create a European-style spa on the property.

Today, Saratoga Spa State park has multiple recreational uses. There are several walking and hiking trails within the park as well as both groomed and un-groomed trails for cross-country skiing and snowshoeing in the winter. The grounds also include a golf course. The park is home to a museum of dance, an automobile museum, and a performing arts center (NYSOPRHP 2010).

The underground transmission cable route abuts the western boundary of the Saratoga Spa State Park. In this area, the cables will be underground almost entirely within the existing CP railroad ROW. There will be no long-term aesthetic impacts or impacts to the public's use and enjoyment of the state park resulting from construction or operation of the Facility. Any impacts during construction, such as noise or temporary impact to public access will be short-term. The Facility will take precautions to avoid and/or minimize conflicts with the Saratoga Performing Arts Center during construction.

2.3.4 NYSDEC Saratoga Nursery

The NYSDEC nursery in the City of Saratoga Springs produces more than 1.5 million tree and shrub seedlings each year on 200 acres of land. Seedlings of more than 50 species are grown and sold or used in reforestation projects. The nursery also provides seedlings to schools so that students can learn about the importance of trees to the environment and become personally involved in establishing a grove (NYSDEC 2010a).

The cable route passes within 75 feet of the eastern boundary of the Saratoga nursery. In this area, the cables will be underground almost entirely within the CP existing ROW. There will be no long-term aesthetic impact on the nursery from the proposed cable. Any construction impacts such as noise will be short term.

2.3.5 Five Rivers Environmental Education Center

The Five Rivers Environmental Education Center in New Scotland is comprised of more than 450 acres of fields, forests, and wetlands. The Center offers a variety of guided and self-guided tours on over 10 miles of trails. In the winter, the trails remain open for skiing and snowshoeing (NYSDEC 2010b).

There are two sections of the underground transmission cable route that closely approach the western boundary of the Five Rivers Environmental Education Center. The route passes within 150 feet of the boundary south of Bluebird Way, and the route abuts the Five Rivers Environmental Education Center in the Game Farm Road area. In this area, the proposed cables will be underground within the existing CSX ROW. There will be no long-term aesthetic impact or impacts to the public's use and enjoyment of the center. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.6 Stony Point Battlefield State Historic Site

Stony Point Battlefield State Historic Site Hook is an approximately 87-acre (Palisades Parks Conservancy, 2011d). The park was the site of a battle during the Revolutionary War and is listed as a stop along the Hudson River Valley National Heritage Area Revolutionary War Trail. It is also the home to the home to the Stony Point Lighthouse, the oldest extant lighthouse on the Hudson. The terrestrial portion of the route will consist of an HDD installation under the park parallel to the existing railroad ROW. No vegetation will be removed from within the park boundaries and, as the cable is buried underground, there will be no long-term aesthetic impact or impacts to the public use and enjoyment of the park.

2.3.7 Hook Mountain State Park

Hook Mountain State Park is approximately 676 acres in size (Palisades Parks Conservancy, 2011c). It is an undeveloped park that extends along almost 7 miles of continuous waterfront and cliff slopes (Audubon Society 2011). The southernmost summit of Hook Mountain rises to about 730 feet, the second highest along the Palisades Ridge (New York New Jersey Trail

Conference 2011). The park is accessible only by bicycle or on foot (Palisades Parks Conservancy 2007b).

Hook Mountain State Park was a recreation area developed from a rock quarry. At one time, visitors from New York City came to the park to picnic, play tennis, swim, fish, and take a ferry ride up the Hudson, which was the main access to the park in the late 1920s (Palisades Parks Conservancy 2007b).

Two recreational hiking/biking trails traverse Hook Mountain State Park. The hiking trail (known as the "Long Trail") runs along the escarpment, while the bike path follows the river's edge from Haverstraw Beach State Park in the Village of Haverstraw to Nyack Beach State Park in Upper Nyack. Remnants of the quarries, park buildings, and the swimming beach are evident along the paths (Palisades Parks Conservancy 2007b and New York New Jersey Trail Conference 2011).

Hook Mountain State Park is a prime location for watching various types of raptors including sharp-shinned hawk, broad-winged hawk, turkey vulture, red-tailed hawk, osprey, and American kestrel (Audubon Society 2011). The Audubon Society estimates that an average of more than 12,000 hawks fly by Hook Mountain each fall (Palisades Parks Conservancy 2007b). Hook Mountain was designated a New York State Important Bird Area in 1997 (Audubon Society 2011 and Palisades Parks Conservancy 2007b). Hook Mountain is also registered as a National Natural Landmark (Palisades Parks Conservancy 2007b).The terrestrial portion of the route will consist of two HDD installations: a 2429 foot HDD from the CSX ROW to through Hook Mountain State Park and Rockland Lake State Park (see Section 2.3.7 for description) and a 2354 foot HDD through Rockland Lake and Hook Mountain state parks. No vegetation will be removed from within the park boundaries and, as the cable is buried underground, there will be no long-term aesthetic impact or impacts to the public use and enjoyment of the park.

2.3.8 Rockland Lake State Park

Rockland Lake State Park is located on a ridge of Hook Mountain and is located between the west bank of the Hudson River and Route 9W. Developed and opened to the public in the early 1960s, the park is a part of the Palisades Interstate Park system.

The park features two Olympic-sized swimming pools and two kiddie pools at two locations, scattered picnic tables and grills, a car-top boat launch and boat rentals, hiking trails with breathtaking views of the Hudson Valley, six tennis courts and two golf courses. Anglers fish Rockland Lake for bass, perch, and norlunge while walkers and joggers use the fitness trail around the lake. During the winter visitors use designated cross-country ski trails and sledding slopes.

There is a 3-mile paved path for walkers and bikers that circles the Rockland Lake. The Knickerbocker Ice Company was established at Rockland Lake in 1831 on the eastern bank. The stored ice was placed on inclined railroad cars, transported down the mountainside, placed on barges on the Hudson River, and shipped to New York City. The Knickerbocker Ice Company closed in 1924 and in 1926 a fire at one of the ice houses resulted in the destruction of the majority of the Village of Rockland Lake.

The terrestrial portion of the route will consist of two HDD installations: a 2,429-foot HDD from the CSX ROW to through Hook Mountain State Park and Rockland Lake State Park and a 2,354-foot HDD through Rockland Lake and Hook Mountain state parks. No vegetation will be removed from within the park boundaries and, as the cable is buried underground, there will be no long-term aesthetic impact or impacts to the public use and enjoyment of the park.

2.3.9 Local and County Parks

The following local and county parks, recreational areas, and open space areas are within 600 feet of the underground portion of the cable route:

- Riverside Park, Whitehall;
- Bertha E. Smith Park, Northumberland;
- Gansevoort Park, Northumberland;
- Saratoga County Forest Land, Northumberland and Wilton;
- Gavin Park, Northumberland;
- Hillhurst Park, Schenectady;
- Roger Keenholts Park, Guilderland;
- Jim Nichols Memorial Park, Village of Voorheesville, New Scotland;
- Mosher Park, Village of Ravena;
- Firemen’s Memorial Park, Village of Coxsackie
- Randall’s Island Park, Bronx, New York City
- Triborough Bridge Playground, Queens, New York City;
- Chappetto Square, Queens, New York City;
- Van Alst Playground, Queens, New York City;
- Astoria Health Playground, Queens, New York City;
- Socrates Sculpture Park, Queens, New York City;
- Ravenswood Playground, Queens, New York City; and
- Rainey Park, Queens, New York City.

2.3.9.1 Riverside Park, Whitehall

Riverside Park is located just south of the Saunders Street Bridge along the west side of the Champlain Canal in the town of Whitehall. Riverside Park recognizes Whitehall as the “Birthplace of the United States Navy” with the use of historical signs, in addition to an American Legion Post 83 War Memorial honoring the veterans among Whitehall residents. Other facilities within the park consist of walking trails, a dock, and a pavilion with views of the Lake Champlain Canal System Lock 12 (Whitehall Chamber of Commerce 2011).

The terrestrial portion of the reconfigured route passes approximately 350 feet to the west of Riverside Park. In this area, the cables will be underground and almost entirely within the existing Route 22 road ROW, therefore, there will be no long-term aesthetic impact to the park. Any construction impacts including noise or temporary impacts to public access will be short term in nature.

2.3.9.2 Bertha E. Smith Park, Northumberland

The Bertha E. Smith Park was deeded to the Town of Northumberland in 1976 to serve the youth of the town. Northumberland's Youth and Recreation uses the park for summer recreation programs, and other youth-oriented groups use the park throughout the year. The facilities include a baseball diamond, a basketball court, a playground, and a pavilion (Town of Northumberland - Town Parks 2010).

The cable route passes within 100 feet of the eastern boundary of the Bertha E. Smith Park. In this area, the cables will be buried within the existing CP ROW. There will be no long-term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.3 Gansevoort Park, Northumberland

Gansevoort Park is located in the Hamlet of Gansevoort in the Town of Northumberland. The park is situated between Leonard Street and Catherine Street and faces the Gansevoort Mansion. The property for the park was deeded to the town by the family of the Revolutionary War General Peter Gansevoort, who desired the land be used as a public park. The park hosted activities celebrating the town's Bicentennial in 1998 (Town of Northumberland - Town Parks 2010).

The cable route passes within 100 feet of the western boundary of the Gansevoort Park. In this area, the cables will be buried within the existing CP ROW. There will be no long-term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or impacts to public access will be short term.

2.3.9.4 Saratoga County Forest Land, Northumberland and Wilton

The County of Saratoga owns and maintains forest lands in the Town of Northumberland that provide for recreation and protection of open space. These lands include the 123-acre Fire Pond tract on Pettis Road, 377 acres of reforested land bordered by Duncan, Colebrook, and Taylor Roads in the central portion of the town, and the 104-acre Kalabus woodlot located at the end of Gailor Lane in southern Northumberland. The county manages these tracts for production, but they are also used by residents for hiking, biking, and other recreational activities. Saratoga County also maintains forest land nearby the proposed underground cable route in the Town of Wilton, adjacent to the Wilton Mall (Town of Northumberland - County Forest Preserve 2010).

The cable route passes within approximately 500 feet of the northwest corner Fire Pond tract of the Saratoga County Forest and within approximately 600 feet of the southeast corner of the tract of county forest adjacent to the Wilton Mall. In these areas, the cables will be underground in the existing CP railroad ROW. There will be no long-term aesthetic impact or impact on the public's use and enjoyment of either the Fire Pond tract or the tract adjacent to the Wilton Mall. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.5 Hillhurst Park, Schenectady

Hillhurst Park is located on Campbell Avenue in the City Schenectady and is managed by the City of Schenectady (City of Schenectady - Parks Department 2010). The proposed cable route passes within approximately 100 feet of Hillhurst Park. Because the Facility consists of cables that will be buried underground, there will be no long term aesthetic impact or impact on the public's use and enjoyment of Hillhurst Park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.6 Roger Keenholts Park, Guilderland

Roger Keenholts Park, named in honor of a town historian, was added to the town of Guilderland's park system in 1993 as the need for additional ball fields increased. Off Hurst and French's Hollow Roads, the park is home to eight little league baseball fields, a Babe Ruth League baseball field and five softball fields (Town of Guilderland - Roger Keenholts Park 2010).

The proposed underground transmission cable route passes within approximately 40 feet of the eastern boundary of Roger Keenholts Park. Because the Facility consists of cables that will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.7 Jim Nichols Memorial Park, Village of Voorheesville, New Scotland

Jim Nichols Memorial Park is maintained by the village of Voorheesville. Located behind the Village Hall, the park offers recreational activities including basketball, tennis, and horseshoes. The park also includes playground equipment (Village of Voorheesville 2010).

The proposed cable route passes within approximately 40 feet of the eastern boundary of Jim Nichols Memorial Park. Because the Facility consists of cables that will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.8 Mosher Park, Village of Ravena

Mosher Park, also known as the Village of Ravena Park Complex, is Ravena's main outdoor recreation area. A number of recreational sports programs use the park complex including adult softball, baseball, and football leagues. Facilities at the park include baseball diamonds, football fields, basketball, volleyball, and tennis courts, a pool complex, a playground and picnic area pavilions (Village of Ravena 2008).

The terrestrial portion of the reconfigured route abuts Mosher Park. In this area, the cables will be buried within the existing railroad ROW. There will be no long-term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.9 Firemen's Memorial Park, Village of Coxsackie

Firemen's Memorial Park is an undeveloped law area in the Village of Coxsackie. Facilities include a sitting bench. The site adjoins NYS Route 285 and the CSX Railroad. There will be no long-term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.10 Randall's Island, Bronx, New York City

Randall's Island is located in the East River between East Harlem, the South Bronx and Astoria, Queens. Randall's Island Park boasts over 60 sports fields, accommodating a variety of sports including baseball, softball, soccer, football, lacrosse, field hockey, and rugby (Randall's Island Sport Foundation 2010).

Randalls Island Park is home to the Golf Center, a 25-acre facility that offers an indoor/outdoor two-tier driving range with 80 stalls, a 36-hole mini golf course, and a short game area with sand bunker and grass tees. A Beer Garden and Grill is also located within the Golf Center. The Sportime Tennis Center offers 20 indoor/outdoor courts as well as food and beverage service, pro shops, and exercise and locker rooms (Randall's Island Sport Foundation 2010).

Randall's Island Park also hosts the Icahn Stadium, a world-class track and field facility. It is the only one of its kind in North America capable of hosting local, regional, and national events. Icahn Stadium offers a 400-meter running track with 5,000 covered spectator seats. Within the Icahn Stadium complex, there is a premier turf soccer field with bleachers for spectator events (Randall's Island Sport Foundation 2010).

The terrestrial portion of the reconfigured route passes approximately 100 feet to the east of Randall's Island Park, on the opposite side of Bronx Kill. In this area, the cables will be underground and almost entirely within the existing CSX rail ROW, therefore, there will be no long-term aesthetic impact to the park. Any construction impacts such as noise will be short term. There will be no impact to public access during construction.

2.3.9.11 Triborough Bridge Playground, Queens, New York City

Triborough Bridge Playgrounds B and C are located on either side of the reconfigured route as it traverses Hoyt Avenue. The City of New York first acquired the land that now constitutes the six Triborough Bridge Playgrounds in two parcels in 1931. The six Triborough Bridge Playgrounds, located on Hoyt Avenue North and Hoyt Avenue South between 21st and 26th streets, provide the surrounding neighborhood with a variety of recreational facilities. Visitors enjoy six basketball and six handball courts, several jungle gyms and swing sets, open play areas, a concrete frog sprinkler system, a comfort station, and numerous sitting areas with benches and trees. Playground B is 6.035 acres while Playground C is 0.46 acres. Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the playgrounds. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.12 Chappetto Square, Queens, New York City

Chappetto Square is considered part of the Triborough Bridge Playground system. The park contains a hockey rink and three trees that surround the flagpole and memorial plaque to honor the memory of Peter Chappetto, an Astoria resident who was killed in action during World War II. The park is 1.23 acres in size and lies to the north of the reconfigured route. Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the playgrounds. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.13 Van Alst Playground, Queens, New York City

Van Alst Playground is adjoined to P.S. 171 and bounded by 14th and 21st Streets, 29th and 30th Avenues. The playground is equipped with several basketball courts, two jungle gyms, swings, sitting areas with benches and game tables (New York City Department of Parks and Recreation, 2011). Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.14 Astoria Health Playground, Queens, New York City

Astoria Health Playground is located on 14th Street between 31 Avenue and 31 Drive. The small park (0.21 acres) includes playground facilities. Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.15 Socrates Sculpture Park, Queens, New York City

Situated at the confluence of the Harlem and East Rivers, the site has a picturesque view of "Hell Gate," or "Hellegat" as originally named by the Dutch colonists. In 1985 a coalition of artists led by local sculptor Mark di Suvero came here with a vision for an outdoor sculpture laboratory dedicated to up-and-coming artists. The enhanced facility provides numerous amenities to the community and expands opportunities for arts and recreation (New York City Department of Parks and Recreation, 2011). Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.16 Ravenswood Playground, Queens, New York City

Ravenswood Playground is bounded by 35th Avenue, 34th Avenue, and 21st Street. The facilities at the approximately 2.76 acre park include a baseball field, basketball court, handball courts, and playgrounds (New York City Department of Parks and Recreation, 2011). Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.9.17 Rainey Park, Queens, New York City

Rainey Park is an approximately 8.99-acre park located to the east of the East River and bounded on the east by Vernon Boulevard. This park is the largest in the neighborhood of Ravenswood, which began to be industrialized beginning in the late 1870s. The riverside promenade and baseball fields make Rainey Park a popular spot for picnicking and play (New York City Department of Parks and Recreation, 2011). Because the cables will be buried underground, there will be no long term aesthetic impact or impact to the public's use and enjoyment of the park. Any construction impacts including noise or temporary impacts to public access will be short term.

2.3.10 Recreational Trails

The following prominent recreational trails were identified as being within close proximity to the revised cable route:

- Champlain Canalway Trail;
- Ballston Veterans Bikeway;
- Erie Canalway Trail;
- Manhattan Waterfront Greenway;
- New York City Water Trail;
- Bronx Bikeway Planning; and
- Queens East River and North Shore Greenway.

2.3.10.1 Champlain Canalway Trail

The Champlain Canalway Trail is a proposed recreation trail which would utilize historic towpaths and canal shoreline, existing local trails, and on-street bicycle routes to provide a continuous route from the Village of Waterford, Saratoga County to the Village of Whitehall, Washington County. The trail is intended to provide recreational opportunities and provide links to regional and community attractions. The trail has been in planning and early development stages for several years, with some trail segments completed or underway, and other segments are conceptual connections where additional planning and development are necessary. The Champlain Canalway Trail planning and development activities have involved many agencies, organizations, municipalities and interest groups, with a working group coordinating these efforts, which are summarized and reported in the 2011 Champlain Canalway Trail Action Plan. The trail is a regional priority project as identified in the 2010 New York State Open Space Conservation Plan (therein called the Champlain Canal Recreationway Trail) and the NY Statewide Trails Plan identifies the Champlain Canalway Trail as one of the state's primary greenway trails.

The reconfigured route traverses several of the municipalities traversed by the Champlain Canalway Trail corridor, including the Village and Town of Fort Edward, and the towns of Kingsbury, Northumberland, Saratoga, Fort Ann, and the Town and Village of Whitehall. The route of the proposed Canalway Trail generally is not along the route through this area, except in the Town and Village of Whitehall. In the vicinity of Whitehall, the Canalway Trail is proposed to follow the towpath and shoreline of the old Champlain Canal. The old canal crosses and is located a short distance to the west of the proposed CHPEI location along the CP Rail lines south of the Village of Whitehall. From the area south of Poultney Avenue in the Village of Whitehall southerly 4.3 miles to a point north of Ryder Road in the Town of Whitehall, the old Champlain Canal is located predominantly on property owned by CP Rail and located a short distance westerly of the active CP Rail lines. Aerial photos (sheets 55 through 71 of Appendix B of the Joint Proposal) show the location of the old canal in relation to the CP Rail properties and the proposed HVDC Transmission System location, and an alternate corridor for location of the HVDC Transmission System which runs along the old Champlain Canal through this area.

The 2011 Champlain Canalway Trail Action Plan describes the existing conditions and provides recommendations for advancing development of the Trail within this area, including a proposal to work with the railroad company to determine the potential of revitalizing the Old Champlain Canal and towpath as a trail route in this area (Champlain Canalway Trail Action Plan, pp. 46-48). The expanded HVDC Transmission System Deviation Zone in this area provides an opportunity for co-location of the underground HVDC cables with the proposed Canalway Trail as a shared use path along the old Champlain Canal towpath. The Facility design could accommodate installing the cables along the proposed route of the Champlain Canalway Trail within Whitehall so that post-construction restoration activities facilitate accommodate off-road bicycle, pedestrian and snowmobile uses, although the decision to pursue this option would need to occur at a later point.

2.3.10.2 Ballston Veterans Bikeway

The Ballston Veterans Bikeway is an improved bikeway which is located in close proximity and parallel to CP Rail ROW in the Town of Ballston, Saratoga County. This bikeway traverses along the western edge of a corridor of property owned by Niagara Mohawk Power Corp. (NMPC), which is largely adjacent to the CP Rail property and the proposed route of the transmission facilities between Outlet Road and Main Street, corresponding to project mileposts 162.1 through 165.5 (see Sheets 238 to 252 of 538, Appendix B to the Joint Proposal). The bikeway is also shown on Figure 2-4, although it should be noted that the route of the bikeway as mapped by the Trails New York Trail Finder website mistakenly places the bikeway on the CP rail tracks, rather than on the improved bikeway which is located approximately 50 to 125 feet westerly of the CP rail alignment. The NMPC property is the site of existing utility facilities, including an overhead electric sub-transmission line, a gas transmission pipeline, and fiber optic cable. The paved bikeway reportedly is used by NMPC as maintenance access for its utility facilities.

Construction of the proposed transmission facilities may have a temporary and limited impact on use of the Ballston Veterans Bikeway, as construction activities will produce noise, potentially dust, and traffic in the railroad property adjoining the bikeway vicinity. Impact minimization will be managed with traffic controls at road crossings, appropriate warnings and markings at ROW access points, and the use of signs as appropriate to control vehicular and recreational traffic in the project vicinity. Any potential use of the NMPC ROW, including the Bikeway as access, would warrant close coordination of impact minimization efforts, to avoid adverse effects on utility and recreational uses of the NMPC property, and detailed planning to be reflected in EM&CP plans and documents.

2.3.10.3 Erie Canalway Trail

The Erie Canalway Trail is a cross-state bicycle and hiking trail which generally follows the towpath of the Erie Canal in segments between Waterford and Buffalo (see Figure 2-5). The trail involves areas where the former towpath is inaccessible or not available, with the trail located on roads or streets, parks or other linkages between canal-side locations.

The Erie Canalway Trail as presently configured crosses the route of the proposed transmission facilities at such a location in the heart of the City of Schenectady, where the trail traverses a segment of State Street (NYS Rt. 5) at the intersection with Erie Boulevard. Construction of the transmission facility will involve excavation and installation of conduits for underground cable location. Measures for construction management, traffic controls and appropriate scheduling will be employed to minimize disruption of traffic at this location, thus avoiding significant impacts to both pedestrian and vehicular traffic at the Canalway Trail crossing, and within downtown Schenectady in general.

2.3.10.4 Manhattan Waterfront Greenway

The Manhattan Waterfront Greenway is a series of trails at waterfront locations linked by on-street segments, providing a continuous circuit around the entire island of Manhattan. The greenway traverses waterfront locations at the Harlem River at Inwood Park overlooking the Spuyten Duyvil, and along the Harlem River waterfront for nearly two miles in the Washington Heights neighborhood south of Sherman Creek Cove within Highbridge Park.

The transmission facility will be located within the Harlem River throughout this section of the Manhattan waterfront, and thus the only impact will be the sight and sound of construction activities associated with cable laying vessels working within the Harlem River during the limited period of cable installation and covering. These impacts will be temporary and are expected to not be significant due to their transitory nature and due to other noise and traffic related to existing surface transportation sources in this urban setting.

2.3.10.5 New York City Water Trail

The New York City Water Trail is a network of safe, legal launches and landings originally established by the NYC Department of Parks and Recreation. This project supports a growing water trail system to assist the public with accessing and traveling the waters of the NY-NJ Harbor Estuary by human-powered boat to promote appreciation, conservation and protection of the estuary's unique and outstanding natural resources (New York City Parks, 2012).

The NYC Water Trail includes several access sites along the waterfront locations that adjoin the proposed transmission facility route. The sites in close proximity include the following:

- Inwood Hill Park – this site provides access to the Harlem River near the Spuyten Duyvil confluence with the Hudson River, from the foot of West Dyckman Street in Manhattan;
- Sherman Creek – this site provides access to the Harlem River from West 202nd Street in Harlem; and

- Hallets Cove – this site provides access to the east channel of the East River via a portage adjoining Socrates Sculpture Park, at 31st Avenue and Vernon Boulevard, in Astoria, Queens.

The transmission facility is proposed to be located in an underwater location within the Harlem River and will bypass any direct location within or directly adjoining the Inwood Hill Park and Sherman Creek access sites. The anticipated facility centerline location is located towards the northerly-easterly shore of the Harlem River, and these access points are located on the south-westerly shore.

Impacts on these recreational access points due to facility construction are anticipated to be nominal at most. While construction activity will involve river occupancy by the cable-laying and support vessels as the cables are laid and any cable cover and protection devices are installed, this occupancy will be temporary and relatively short-lived. Views of construction activities from these recreational access points will occur, however, the river is used for commercial traffic and recreational boating, and the presence of construction vessels is not un-common in this reach of the Harlem River. Other transportation traffic in views from these locations includes trains transiting the CSX rail lines along the northerly-easterly shore of the Harlem River, and vehicular traffic on streets, highways and bridges along and across the Harlem River.

The Transmission System termination at the Rainey Substation in Astoria, Queens is near to the Hallet’s Cove waterfront access point at Vernon Boulevard. This access site is a gravel beach in an area with mixed open space, industrial and utility uses at the East River waterfront. Impacts on this recreational access point are anticipated to be nominal at most. Transmission facility construction will occur at the upland Vernon Boulevard side of the Rainey substation. There will likely be some controlled restrictions on pedestrian and vehicle traffic at Vernon Boulevard as excavation and installation of conduits to accommodate underground transmission cables occurs: this activity will be short-lived, and will be subject to conditions to minimize disruptions of traffic, and access to the waterfront launch would not be precluded. Views from the recreational access site to the facility construction site will not be significantly affected, due to the nature of the waterfront setting adjoining existing major utility infrastructure.

2.3.10.6 Bronx Bikeway Planning

Potential bikeway improvements in the vicinity of the route in upland location in the Bronx as indicated in the 2011 NYC Cycling Map (see Figure 2-6) include a proposed route across the northerly side of the Harlem River Yards coinciding with the paved drive in this off-street area. Since the planned CHPEI route is along the CSX rail lines at the southern edge of the yards, there will be no conflict with development of either through-corridor. The proposed bikeway connection to Randalls Island beneath the Hell Gate railroad bridge has been accommodated in the design of the HVDC Transmission System by use of HDD to avoid conflict with that proposed transportation improvement.

2.3.10.7 Queens East River and North Shore Greenway

The Queens East River and North Shore Greenway is a proposed 10.6-mile urban shared-use trail, intended to provide access to the shoreline in Queens and improve non-motorized commuter options. It will connect the neighborhoods of Long Island City, Hunters Point, Ravenswood, and Astoria in western Queens with Steinway, Jackson Heights and East Elmhurst in northeastern Queens and connect four parks on the East River shoreline. This proposed greenway is part of an ambitious multiyear effort to implement a comprehensive citywide network of cycling lanes and greenways. (New York City, Department of City Planning and Department of Parks & Recreation; Queens East River and North Shore - Greenway Master Plan, 2006; pp. 15-40.)

The only specific improvement proposed for the immediate area of the CHPEI project which has not been implemented is development of a shoreline bikeway within Rainey Park which adjoins the designated bike lanes along Vernon Boulevard, as depicted in the Figure 2-7. Impacts will be limited to short-term construction impacts which can be minimized by appropriate controls for vehicular and pedestrian traffic. Where the transmission facility cables are constructed in streets with bicycle lanes, construction planning will accommodate traffic flows with appropriate controls, schedules and site-specific planning design to minimize disruptions caused by construction activities.

2.3.11 Public Lands in the Vicinity of the Proposed Converter Station

A review of the readily available mapping[5] indicates that there are no parks and public recreation areas within 1,000 feet of the Luyster Creek converter station. All work at the Luyster Creek converter station will be conducted on the property, so there would be no long-term impact on public access if any parks were in the area. Any construction impacts, such as additional noise or traffic delays, will be short-term in nature. Further information on potential visual impacts in the vicinity of the Luyster Creek converter station site is provided in Section 11.

2.4 Agricultural Districts

Article 25-AA of the Agriculture and Markets Law authorizes the creation of local agricultural districts pursuant to landowner initiative, preliminary county review, state certification, and county adoption. These districts encourage improvement and continued use of agricultural land for the production of food and other agricultural products. An important benefit of the Agricultural Districts Program is the opportunity provided to farmland owners to receive real property assessments based on the value of their land for agricultural production rather than on its development value. The Agricultural Districts Law and the Agricultural and Farmland Protection programs have influenced municipal comprehensive plans and zoning regulations. County agricultural and farmland protection boards may develop protective plans in collaboration with county soils and water conservation districts. The Agricultural Districts Law protects farmers against local laws that may unreasonably restrict farm operations located within an agricultural district.

[5] Open Accessible Space Information System (OASIS), Accessed on April 14, 2011 at: http://oasisnyc.net/pages/update.aspx.

Mapping of the Agricultural Districts in Washington County, Saratoga County, Albany County, Greene County, and Rockland County was obtained from the Cornell University Institute for Resource Information Sciences (Cornell IRIS), which maintains the county-produced Agricultural District maps on file under contract with the New York State Department of Agriculture and Markets. Mapping information on the Agricultural Districts is provided in Figure 2-1. The proposed Facility crosses within 200 feet of several Agricultural Districts as presented on Table 2-3. Based on this information, the proposed Facility will cross in the vicinity of about 46,690 linear feet of Agricultural Districts within Washington County, 47,640 linear feet in Saratoga County, 660 linear feet in Schenectady County, 20,560 linear feet in Albany County, and 22,490 linear feet in Greene County. The proposed Facility does not cross Agricultural Districts in Rockland or New York counties. Overall, the underground portions of the proposed Facility will cross in the vicinity of an estimated 26.2 miles of land within Agricultural Districts.

The proposed Facility is not anticipated to impact agricultural land uses in the Agricultural Districts, since along the majority of the underground route, installation will occur within existing railroad or roadway ROWs.

2.5 Coastal Consistency

This section discusses the consistency of the Facility with New York Coastal Zone Management Policies and with Article 42 of the Executive Law entitled: *Waterfront Revitalization of Coastal Areas and Inland Waterways.* Local municipalities that border coastal areas and inland waterways may voluntarily prepare LWRPs, in conjunction with the NYSDOS, for the preservation, enhancement, protection, development, and use of the state's coastal and inland waterways and adjacent waterfront land. Projects which may impact coastal areas or inland waterways must be reviewed for consistency with those LWRPs that pertain to territory within the vicinity of the Facility. This section includes a review of consistency with coastal policies and LWRPs for both the underwater portions of the route and the underground portions of the Facility potentially located in coastal or waterfront areas, such as the cable landfalls and aboveground facilities.

2.5.1 New York Coastal Zone Management Policies

The federal Coastal Zone Management Act (CZMA) requires that Federal agency activities within or outside the coastal zone that affect any land or water use or natural resource of the coastal zone shall be reviewed for consistency with the enforceable policies of approved State management programs.

In New York State, the enforceable coastal policies are those in the New York State Coastal Management Program (CMP) and the enforceable policies of any LWRP. The assessment of compliance with the New York City Waterfront Revitalization Program is discussed below in Section 2.5.2. The following review shows that the underwater portions of the Facility, the landfall to the Hudson River in the Town of Catskill, the Hell Gate Bypass and construction and operation of the Luyster Creek converter station are consistent with the CMP program.

There are 44 policies under the CMP. The consistency of the Facility with each of these policies is described below.

Policy 1 - *Restore, revitalize, and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational, and other compatible uses.*

The cable landfall in the Town of Catskill will be constructed by the HDD and will not impact any deteriorated or underutilized waterfront areas. Construction and operation of the Luyster Creek converter station, and interconnection to the Astoria and Rainey Sites will provide a new industrial use and a new important source of electricity that will benefit development in the area. This work will not in any way interfere with CZMA's desire to restore, revitalize, and redevelop waterfront areas.

Policy 2 - *Facilitate the siting of water-dependant uses and facilities on or adjacent to coastal waters.*

The Facility is not water-dependent. It is proposed to be buried for its entire length, from entering NYS at the Canadian border to its connection at the Luyster Creek converter station, excepted in limited locations where it will be attached to existing bridge structures. Portions of the Facility will be buried beneath the bed of Lake Champlain and the Hudson, Harlem and East Rivers. As a result of construction and during regular operation of the Facility, it will not displace existing water-dependent or water-enhanced uses or activities, nor will future water-dependent and water-enhanced uses be prevented from being sited on, in or adjacent to the water.

Policy 3 - *Further develop the state's major ports of Albany, Buffalo, New York, Ogdensburg, and Oswego as centers of commerce and industry, and encourage the siting, in these port areas, Including those under the Jurisdiction of state public authorities, of land use and development which is essential to, or in support of, the waterborne transportation of cargo and people.*

This policy is not applicable.

Policy 4 - *Strengthen the economic base of smaller areas by encouraging the development and enhancement of those traditional uses and activities which have provided such areas with their unique maritime identity.*

Neither the underwater cable routing nor the landfall in the Town of Catskill will interfere with policies to enhance traditional maritime uses. Construction and operation of the Luyster Creek converter station and interconnection work are located in industrial areas and will not conflict with policies to enhance traditional maritime uses.

Policy 5 - *Encourage the location of development in areas where public services and facilities essential to such development are adequate.*

The interconnection transmission facilities and converter site access road are located within the Coastal Area. Siting the converter station in industrial-utility use area of the Coastal Area is consistent with Policy 5.

Policy 6 - *Expedite permit procedures in order to facilitate the siting of development activities at suitable locations.*

This policy is not applicable.

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

The cable landfall along the Hudson River in the Town of Catskill will utilize HDD methods to install the cable. This method will be utilized to avoid and/or minimize disturbance to shoreline and nearshore coastal fish and wildlife habitats. The HDD is expected to exit the water at a depth sufficient to avoid impacts to shoreline, intertidal and nearshore areas. Construction and operation of the Luyster Creek converter station and interconnection work are located in previously disturbed areas where there is no Significant Coastal Fish and Wildlife Habitat (SCFWH), and therefore this policy is not applicable.

The proposed underwater cable route intersects five SCFWHs: Esopus Estuary, Kingston Deepwater Habitat, Poughkeepsie Deepwater Habitat, Hudson River mile 44-56, and the Lower Hudson Reach. In general, because the transmission cable will be installed primarily below the sediment and within deeper areas, the Facility will have an insignificant impact on these habitats, and will avoid and/or minimize impacts to intertidal areas and tidal wetlands. Section 8.4.1 provides detailed information on SCFWHs along the Facility route, including potential impacts and proposed avoidance and/or minimization measures.

Policy 8 - *Protect fish and wildlife resources in the coastal area from bio-accumulation of hazardous wastes and other pollutants which bi-accumulate in the food chain or which cause significant sublethal or lethal effect on those resources.*

Any hazardous materials used will be handled and stored in accordance with local, state, and federal regulations, to avoid and/or minimize the potential for contamination of coastal waters. A Spill Prevention Control and Countermeasures (“SPCC”) Plan or its equivalent will be developed as part of the EM&CP, as well as Best Management Practices (“BMPs), to address such contingencies.

In addition, the cable route has been specifically sited to avoid sediments in the more heavily PCB contaminated reaches of the Upper Hudson.

Policy 9 - *Expand coastal use of fish and wildlife resources in coastal areas by increasing access to existing stocks, and developing new resources.*

This policy is not applicable.

Policy 10 - *Further develop commercial finfish, shellfish and crustacean resources in the coastal area by encouraging the construction of new, or improvement of existing on-shore commercial fishing facilities, increasing marketing of the state’s seafood products, maintaining adequate stocks, and expanding aquaculture facilities.*

This policy is not applicable.

Policy 11 *- Building and other structures will be sited in the coastal area so as to minimize damage to property and the endangering of human lives caused by flooding and erosion.*

Portions of the Luyster Creek property are located within mapped Flood Hazard Areas AE and X (see Figures 2-8A and 2-8B). Any facilities sited within the areas of mapped Flood Hazard will be designed to avoid flood hazard damage on the site or at any other properties. The underground cables will be backfilled to restore pre-existing contours, resulting in no change in flooding or erosion characteristics. The underwater cables will have very small areas, over crossings of foreign utilities, where armoring will create a very slight elevation in bottom elevation. This will result in an insignificant change in storage volume of Lake Champlain or in the cross sectional area of the canal or rivers, resulting in no change in flooding or erosion characteristics.

Policy 12 *- Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural features including beaches, dunes, barrier islands and bluffs.*

The transmission cable route is not expected to impact any beaches, dunes, barrier islands or bluffs because none exist along the route. In addition, the cable installations at shoreline crossing locations will use HDD methods that avoid disturbing the ground surface and do not alter flooding and erosion characteristics.

This policy is not applicable to the Luyster Creek Converter Station Site. Natural Protective features are specifically designated and mapped under the authority of ECL Article 34, the Coastal Erosion Hazard Areas Act. The Luyster Creek area in Queens is not a mapped coastal erosion hazard area or natural protective feature.

Policy 13 *- The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least thirty years as demonstrated in design and construction standards and/or assured maintenance or replacement programs.*

At the transition of the HVDC underwater cables from water to coastal shoreline, installation will be accomplished through the use of HDD methodology in order to avoid and/or minimize disturbance to the bank and near shore area. Upon completion of the installation of the underground transmission cable, the surface of the right-of-way disturbed by construction activities will be graded to match the original topographic contours and to be compatible with surrounding drainage patterns, except at those locations where permanent changes in drainage will be required to prevent erosion that could lead to possible exposure of the cable. Upon completion of the construction activities, all disturbed areas will be stabilized in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment. Construction, maintenance and operation of the proposed transmission Facility would not result in increases in flooding and erosion, or the potential for damages resulting from flooding and erosion.

Policy 14 *- Activities and development, including the construction or reconstruction of erosion protection structures, shall be under taken so that there will be no measurable increase in erosion or flooding at the site of such activities or development, or at other locations.*

The HDD installation measures for shoreline crossings, and cable burial by jetting serve to avoid project induced changes in flooding or erosion, and to avoid and/or minimize damage to natural resources and property.

This policy is not applicable to the construction and operation of the Luyster Creek converter station or interconnection work to the Astoria and Rainey substations, as the site is currently planned to be set back from the waterway and do not require erosion protection. If erosion control is necessary, the Applicants would expect to consider non-structural measures. The details of the measures and protocols to be employed will be presented in the EM&CP.

Policy 15 *- Mining, excavation, or dredging in coastal waters shall not interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such land.*

Installation of the underwater portions of the transmission cable, which will involve trenching, is not expected to interfere with natural coastal processes or increase erosion of adjacent lands.

Policy 16 *- Public funds shall only be used for erosion structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features.*

This policy is not applicable as public funds will not be used for erosion structures.

Policy 17 *- Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible.*

The HDD installation measures for shoreline crossings, and cable burial by jetting serve to avoid project induced changes in flooding or erosion, and to avoid and/or minimize damage to natural resources and property.

This policy is not applicable to the construction and operation of the Luyster Creek converter station or interconnection work to the Astoria and Rainey substations, as the sites currently planned to be set back from the waterway and do not require erosion protection. If erosion control is necessary, the Applicants would expect to consider non-structural measures.

Policy 18 *- To safeguard the vital economic, social, and environmental interests, and the safeguards which the state has established to protect valuable coastal resource areas.*

This work will not impair or reverse vital economic, social, and environmental interest safeguards, including those established to protect valuable coastal resource areas.

Construction and operation of the Luyster Creek converter station and interconnection work to the Astoria and Rainey substations will be at existing previously disturbed sites and will not affect the policy goal of safeguarding vital economic, social, and environmental interests. The proposed transmission cables will provide a new, important source of electricity that will benefit development in the area

Policy 19 *- Protect, maintain, and increase the level and types of access to public water-related recreation resources and facilities.*

Recreational use of the Hudson River by recreational boaters and shoreline fishing will not be significantly affected by installation of transmission cables beneath the waters and bed of the Hudson River. Cable-laying vessels will move slowly along the length of the River between New York City and the Capital District, and support vessels will move from shoreline locations to the cable-laying vessel, during surveys, test runs, pre-construction and construction phases of project development. Cable construction in the River is expected to occur over a period of several months at prime recreational season. The cable-laying vessel, however, will not have impacts on recreational uses that are significantly different than other large ocean-going vessels such as tankers or freighters which commonly travel through the coastal waters of the River, and impacts are expected to be temporary for the duration of construction and construction-related activities only. A United States Coast Guard 'Notices to Mariners' will be required in advance of any water-borne construction and construction-related activities.

Cables at the landfalls at all shoreline crossings will be installed using HDD methods which will result in no permanent impacts to public access to the waterbodies. Underwater cable burial will result in no permanent impacts to public access. During construction, to protect the safety of the public, access will be restricted around active in-water construction sites. This work will only occur on a small area of the overall waterbody and will be temporary in any one location, so impacts will be minor during the construction period.

The South Bronx Greenway Plan provides for increased access to waterfront areas. Projects include a pedestrian greenway along the Harlem River and the Stony Point Overlook. The Plan also advocates for the construction of the Randall’s Island Connector, a quarter mile pedestrian pathway from 132nd St to Randall’s Island, which would run underneath the historic arches of the elevated Amtrak trestle. The Facility will be underground and will be designed, installed and operated so as to not interfere with the South Bronx Greenway or any planned recreational access improvements. Existing uses at the upland Facility location within the Bronx are controlling factors in potential recreational land uses of the waterfront, which will not be affected by the Facility location or operation.

Construction and operation of the Luyster Creek converter station and interconnection work to the Astoria and Rainey substations are located on private utility sites or public roadways that are already disturbed. As discussed in Section 2.2.8.1, the City of New York’s Vision 2020 document calls for efforts to be made to increase public access to Luyster Creek from 19th Avenue. Facility layout and security features will be designed to not conflict with any NYC plans for limited public access to this waterway at the site.

***Policy 20** - Access to the publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publically-owned shall be provided and it shall be provided in a manner compatible with adjoining uses.*

The proposed waterfront locations of the Facility's cable facilities are within areas of other existing or planned industrial or transportation uses. Such uses are controlling factors in potential recreational use of, and access to, the waterfront. To the extent that controlling uses can accommodate future recreational use and access, they will not be significantly affected by the Facility location and operation. The routing is not expected to prevent the location of recreational and public access opportunities in the future.

***Policy 21** - Water-dependant and water-enhanced recreation will be encouraged and facilitated, and will be given priority over non-water related uses along the coast.*

The proposed waterfront locations of the Facility's cable facilities are within areas of other existing or planned industrial or transportation uses. Such uses are controlling factors in potential recreational use of, and access to, the waterfront. To the extent that controlling uses can accommodate future recreational use and access, they will not be significantly affected by the Facility location and operation. The Facility is not expected to prevent the location of recreational and public access opportunities in the future.

***Policy 22** - Development, when located adjacent to the shore, will provide for water-related recreation, whenever such is compatible with reasonably anticipated demand for such activities, and is compatible with the primary purpose of the development.*

This work will not in any way interfere with CZMA's desire to provide for water-related recreation. Construction and operation of the Luyster Creek converter station and interconnect work sites are on properties zoned for industrial use and do not conflict with this goal.

Buried HVDC cables will allow water-related recreation to occur.

***Policy 23** - Protect, enhance and restore structures, districts, areas and sites that are of significance in the history, architecture, archaeology or culture of the state, its communities, or the nation.*

In general, the routing is unlikely to have a significant effect on standing historic structures, districts, areas, or sites of significance within the Facility's vicinity. The Facility's HVDC cables will be buried and will not have an effect on the viewshed. The cables will be installed underneath Stony Point State Historic Site via HDD. The Luyster Creek converter station will be designed to match the character of the surrounding area, and is not expected to have an adverse impact on any historic properties in the vicinity. The interconnection to the Astoria and Rainey substations will not involve overland lines.

A detailed analysis of archaeological sites, historic properties, and shipwrecks, including those resources listed in or eligible for inclusion in the National Register, along the route is provided in Section 10. It is anticipated that with appropriate avoidance and/or minimization measures, impacts on cultural resources will be insignificant.

Policy 24 *- Prevent impairment of scenic resources of statewide significance.*

There are six Statewide Areas of Scenic Significance ("SASS") located in the Hudson River Valley from northern portions in Town of Stony Point to northern Columbia and Greene Counties. The upland portion of the route crosses a section of SASS Sub-unit CO-3 of the Catskill-Olana SASS from the southern boundary of the Village of Catskill, along the "West Shore Railroad", and then along the western perimeter of the Sub-Unit as the railroad is located essentially parallel to NYS Route 9W south of the point where CSX crosses under 9W south of the Village of Catskill, for a total distance of approximately 3.4 miles. Due to its location at the far western periphery of the SASS unit, the railroad corridor along Route 9W does not play an important role in defining landscape or adding characteristics to the scenic area. The clearing of vegetation along the CSX railroad ROW will have an insignificant impact on views of the CO-3 Kykiut sub-unit from the prominent Olana sub-unit which includes the Olana mansion.

The Facility enters the Hudson River at Cementon, within the Town of Catskill, to the north of the Ulster North SASS (Subunit UN-1) and visible to the Estates District SASS (Subunit ED-1). The location selected for the Facility to re-enter the Hudson River at Cementon is an industrial landscape dominated by large-scale cement processing and handling structures and equipment, and areas of industrial landfill as evidenced by grassy dome-like slope features. The landfall is at a bulkheaded shoreline location between two prominent cement processing facilities. The landfall location will be marked with a cable warning sign (Figure 11-4) which is intended to provide a safety notice to Hudson River vessels regarding the presence of buried high-voltage electric cables. The Facility is not anticipated to diminish or alter the attributes of any SASS sub-unit. A more detailed discussion can be found in Section 11.3.1 of this document.

Policy 25 *- Protect, restore or enhance natural and man-made resources, which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.*

The Facility's principal components will be buried and will not have an effect on the viewshed. The cables will transition from water to land at locations such as Stony Point via HDD installations so that the installation will not be visible. Similarly, the HDD installation under Hook Mountain State Park and Rockland Lake State Park will ensure there is no impact on the scenic quality. Following construction, natural conditions are expected to be restored, where necessary. A further discussion of visual resources in the Facility area is provided in Section 11.

Policy 26 *- Conserve and protect agricultural lands in the state's coastal area.*

The Facility will be located in close proximity to agricultural lands adjoining the CSX railroad corridor at Coastal areas in Town of Catskill. If the Applicants identify areas that may pose a risk to agriculture lands or operations, an Agricultural Inspector will be employed to oversee the agricultural resources traversed by the route. Following site restoration, a monitoring and remediation period of two (2) growing seasons will be completed in disturbed active agricultural areas in order to identify any remaining agricultural impacts associated with construction that need to be addressed and to implement the follow-up restoration.

Policy 27 *- Decisions on the siting and construction of major energy facilities in the coastal area will be based on public energy needs, compatibility of such facilities with the environment, and the facility's need for a shorefront location.*

All of the interconnection points considered and studied in New York City are located within the designated Coastal Area. While the proposed converter station would not be a water-dependent use, its siting would be compatible with other similar uses at the Luyster Creek location and would not displace other existing or planned water-dependent or water-enhanced uses at that location.

Policy 28 *- Ice management practices shall not interfere with the production of hydroelectric power, damage significant fish and wildlife and their habitats, or increase shoreline erosion or flooding.*

This policy is not applicable.

Policy 29 *- Encourage the development of energy resources on the Outer Continental Shelf, in Lake Erie and in other water bodies, and ensure the environmental safety of such activities.*

This policy is not applicable.

Policy 30 *- Municipal, industrial, and commercial discharge of pollutants, including but not limited to toxic and hazardous substances, into coastal waters will conform to state and national water quality standards.*

Based on hydrodynamic modeling of the Hudson, Harlem and East Rivers, it is anticipated that installation of the submarine cables will result in short-term impacts from sediment re-suspension. Pre-installation trials and construction monitoring will be implemented in order to ensure that the Facility conforms to existing water quality standards, as referenced in the proposed 401 Water Quality Certificate developed in conjunction with the revised routing. In accordance with the Stormwater Pollution Prevention Plan, to be included with the proposed EM&CP, procedures for erosion and sediment control shall be implemented early in the Facility and converter station construction process and prior to the start of grading and excavation activities; such procedures shall be maintained throughout the construction period and in accordance with New York Standards and Specifications for Erosion and Sediment Control.

Policy 31 *- State coastal area policies and management objectives of approved local waterfront revitalization programs will be considered while reviewing coastal water classifications and while modifying water quality standards; however, those waters already overburdened with contaminants will be recognized as being a development constraint.*

Compliance with LWRPs is discussed below in Section 2.5.2. Water quality for waterbodies along the underwater portions of the route is discussed in Section 6.

Policy 32 *- Encourage the use of alternative or innovative sanitary waste systems in small communities where the costs of conventional facilities are unreasonably high, given the size of existing tax base of these communities.*

This policy is not applicable.

Policy 33 *- Best management practices will be used to ensure the control of stormwater drain runoff and combined sewer overflows draining into coastal waters.*

The proposed work will be constructed and operated in accordance with Best Management Practices (BMPs) to control stormwater (and combined sewer overflows draining into coastal waters). The Applicants will apply for and operate the facilities in accordance with any required SPDES stormwater permits.

Policy 34 *- Discharge of waste materials into coastal waters from vessels subject to state jurisdiction will be limited so as to protect Significant Fish and Wildlife Habitats, recreational areas and water supply areas.*

BMPs and environmental compliance monitoring will be employed on vessels during construction to manage the handling and proper disposal of waste materials, in order to prevent them from entering Coastal Waters. Sanitary wastes will be held in tanks, offloaded as needed and properly disposed of at approved facilities, and will not be discharged to Coastal Waters.

Policy 35 *- Dredging and filling in coastal waters and disposal of dredged materials will be undertaken in a manner that meets existing state permit requirements, and protects Significant Fish and Wildlife Habitats, scenic resources, natural protective features, important agricultural lands, and wetlands.*

Installation of the underwater portions of the transmission cable will comply with existing state permit requirements and will be undertaken in a manner that protects SCFWHs, scenic resources, natural protective features, important agricultural land, and wetlands (see Sections 8.4.1 and 5). Where the cable is within the navigational channel, the Facility must comply with the requirements of the NYSDEC, United States Army Corps of Engineers (USACE), and United States Environmental Protection Agency (USEPA). This may require that the navigational channel be dredged to a required depth and then the cable is laid below this depth so future dredging will not disrupt the cable. The Applicants will comply with all requirements for the disposal of any dredged material.

This policy is not applicable to the Luyster Creek converter station.

Policy 36 *- Activities related to the shipment and storage of petroleum and other hazardous materials will be conducted in a manner that will prevent or at least minimize spills into coastal waters; all practicable efforts will be undertaken to expedite the cleanup of such discharges; and restitution for damages will be required when these spills occur.*

To the extent there is petroleum and other hazardous materials transported or stored on site, such transport and storage will be conducted in accordance with local, state, and federal regulations in order to protect the aquatic resources in the area. Transport and storage procedures will be developed and detailed in the EM&CP.

Policy 37 - *Best Management practices will be utilized to minimize the non-point discharge of excess nutrients, organics, and eroded soils into coastal waters.*

Soil erosion and sediment movement offsite will be avoided and/or minimized during construction and operation via erosion control measures and soil stabilization protocols, which will be implemented as necessary to protect the aquatic resources in the area. The details of the measures and protocols to be employed will be presented in the EM&CP.

Policy 38 - *The quality and quantity of surface water and groundwater supplies will be conserved and protected, particularly where such waters constitute the primary or sole source of water supply.*

Surface and groundwater resources (see Section 5) will be protected by implementing diligent management of any hazardous substances on the sites and erosion control measures to prevent sediment transport to the water way. The necessary protection measures will be detailed in the EM&CP.

Policy 39 - *The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as to protect groundwater and surface water supplies, Significant Fish and Wildlife Habitats, recreation areas, important agricultural land, and scenic resources.*

Surface and groundwater resources, significant fish and wildlife habitats, recreation areas, important agricultural land, and scenic resources will be protected by implementing diligent management of any solid wastes, particularly hazardous substances during all construction activities. The details of the measures and protocols to be employed will be presented in the EM&CP.

Policy 40 - *Effluent discharges from major steam electric generating and industrial facilities into coastal waters will not be unduly injurious to fish and wildlife and shall conform to state water quality standards.*

This policy is not applicable.

Policy 41 - *Land use or development in the coastal area will not cause national or state air quality standards to be violated.*

The Facility will not violate applicable air quality standards. Modeling efforts have predicted that the implementation of the Facility could reduce greenhouse gases SOx, NOx, and CO2 in the range of 499-571 tons, 744-1,432 tons and 1.5-2.2 million tons, respectively.

Policy 42 - *Coastal management policies will be considered if the state reclassifies land areas pursuant to the prevention of significant deterioration regulations of the Federal Clean Air Act.*

This policy is not applicable.

Policy 43 *- Land use or development in the coastal area must not cause the generation of significant amounts of acid rain precursors: nitrates and sulfates.*

The Facility will not generate emissions that release nitrates or sulfates to the atmosphere during operation. Modeling efforts have predicted that the implementation of the Facility could reduce greenhouse gases Sox and NOx in the range of 499-571 tons and 744-1,432 tons, respectively.

Policy 44 *- Preserve and protect tidal and freshwater wetland and preserve the benefits derived from these areas.*

Since the underground cables will be buried, any wetlands crossed will remain wetlands after construction. The cable crossings of shorelines will be undertaken using HDD methods to avoid and/or minimize impacts to any tidal wetlands in these areas. The HDD is expected to exit the water at a depth sufficient to avoid impacts to intertidal and foreshore areas.

The Facility has been designed to avoid and/or minimize impacts to tidal and estuarine wetlands to the extent feasible by installing the underwater portions of the transmission cables within the deeper subtidal zones and by using HDD construction methods for all landfall locations. The Facility route is located near the Hudson River National Estuarine Research Reserve but the cables will be located within the subtidal zone in this area; therefore, no impacts to important vegetated wetland or intertidal habitats are anticipated.

It is anticipated that construction and operation of the Facility may result in temporary impacts to wetlands. This may include areas where the edge of the cleared construction corridor traverses a wetland or riparian area or where vegetation clearing and ground disturbance occurs in adjacent uplands. In limited areas, permanent conversion of forested wetland to scrub-shrub wetland may occur in those areas where vegetation management is needed during operation. The success of wetland re-vegetation shall be monitored and recorded annually for the first two (2) years after construction, or longer, until wetland re-vegetation is successful.

The Luyster Creek converter station and the interconnect to the Astoria and Rainey substations will not result in any impacts to wetlands.

2.5.2 Waterfront Revitalization of Coastal Areas and Inland Waterways

The NYSDOS implements Article 42 of the Executive Law entitled: Waterfront Revitalization of Coastal Areas and Inland Waterways. Local municipalities that border coastal areas and inland waterways are encouraged to prepare LWRPs), in conjunction with NYSDOS, for the preservation, enhancement, protection, development and use of the state's coastal and inland waterway. Under the statute, LWRPs shall be reviewed and approved by the NYSDOS before they become effective. Projects which may impact coastal areas or inland waterways must be reviewed for consistency with all of the LWRPs that have been prepared. The NYSDOS has developed 44 policies to be implemented by LWRPs. In addition, several LWRPs have amended the policies and added new policies to protect natural resources unique to their specific areas. Project sponsors must review these policies to ensure that their project is consistent with the policies in the LWRP and will balance the need between natural resources, population growth, and economic development.

There are 22 municipalities with LWRPs along the cable route from the Town of Essex to New York City. These are listed below in order from the Canadian border to the New York-Connecticut border:

1. Town of Essex
2. Village of Whitehall
3. Village of Tivoli
4. Village of Saugerties
5. Town of Redhook
6. City of Kingston
7. Town of Rhinebeck
8. Town of Esopus
9. Town of Poughkeepsie
10. Town of Lloyd
11. City of Beacon
12. City of Newburgh
13. City of Peekskill
14. Town of Stony Point
15. Village of Haverstraw
16. Village of Croton on the Hudson
17. Village of Ossining
18. Village of Nyack
19. Village of Sleepy Hollow
20. Village of Piermont
21. Village of Dobbs Ferry
22. New York City

Of the 44 state coastal policies, 29 pertain to and have been evaluated for this project, as presented in the previous section. After review of all 22 LWRPs, including the NYSDOS policies contained in those documents, as well as the local policies, it has been determined that this Facility is consistent with the 29 relevant state policies within the context of all 22 LWRPs. Additional local policies that relate to the Facility are evaluated on a case-by-case basis below.

2.5.2.1 Consistency with Local Waterfront Revitalization Plans

<u>Town of Essex</u>

The Town of Essex has identified Split Rock Mountain, Webb Royce Swamp, Essex "Station," and the Boquet River as significant fish and wildlife habitats. Split Rock Mountain, Webb Royce Swamp, and Essex "Station" are adjacent to the coastal zone area and will not be affected by this Facility. The Boquet River discharges into Lake Champlain and will not be affected by this Facility.

***Policy 5** - Protect and restore ecological resources, including Significant Fish and Wildlife Habitats, wetlands and rare ecological communities (similar to NYSDOS Policy 7).*

This Facility in the Town of Essex involves the placement of HVDC cables in the bed of Lake Champlain and the Champlain Canal using water jetting and/or trenching to open up the benthic substrate, lay the cable, and re-contour the bottom. There will be some temporary turbidity as discussed in Section 6. The Applicants will avoid and/or minimize impacts to native fish as described in Section 7. Additionally, Section 8 provides an assessment of wildlife habitats, and rare ecological communities and Section 5 provides information on wetlands in the Facility area.

***Policy 6** - Protect and improve water resources (similar to NYSDOS Policy 38).*

It is anticipated that laying the cables in the bed of the lake and canal will cause some temporary and localized turbidity. The Applicants will avoid and/or minimize impacts to protect water resources as described in Section 6.

***Policy 6.3** - Protect water quality when excavating or placing fill in navigable waters and in or near marshes, estuaries, and wetlands (a combination of NYSDOS Policies 34 and 35).*

It is anticipated that laying the cables in the bed of the lake and canal will cause some temporary and localized turbidity. The Applicants will avoid and/or minimize impacts to protect water resources as described in Section 6. Section 5 addresses the existing freshwater and tidal wetlands in the Facility area, including potential impacts and avoidance, minimization and/or mitigation measures. In general, impacts to wetlands in the Facility area are expected to be temporary. Where wetlands cannot be avoided, the Applicants will implement appropriate BMPs during construction to avoid, minimize and/or mitigate impacts to benefits derived from these resources.

Village of Whitehall

***Policy 5.1** - Protect Significant Coastal Fish and Wildlife Habitats (similar to NYSDOS Policy 7).*

CHPEI will work closely with NYSDOS, NYSDEC, New York Natural Heritage Program (NYNHP), and local municipalities to avoid and/or minimize disturbance to these areas.

Village of Tivoli

***Policy 7** - Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

Sections of North and South Tivoli Bay are within the Village of Tivoli. This is a SCFWH recognized by NYSDOS with a significance rating of 162.

This area will be avoided by the Facility (see Section 8.4.1).

Policy 7A - *The locally significant habitats of Stony Creek and the Hudson River along Tivoli's waterfront will be protected, preserved and improved. The Hudson River Bluffs, Tivoli Bay, and Stony Creek should be protected from overdevelopment.*

This Facility routing will avoid Tivoli Bay and Stony Creek and not induce development in the area.

Village of Saugerties

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

The Esopus Estuary has been designated a SCFWH by the NYSDOS. It has a significance rating of 98. The boundary of the Esopus Estuary extends across the Hudson River. It is impossible to avoid the boundary area of the Esopus Estuary. However, the New York State Department of Conservation (NYSDEC) has identified those areas of particular significance within this resource area and these zones will be avoided to the maximum extent possible based on sound engineering.

There is expected to an insignificant impact to the Esopus Estuary as the proposed cable route will be sited on the east side of the Hudson River and will not result in a loss of habitat since impacts are temporary for a buried cable installation (see Section 8).

Policy 44A - *Preserve wetlands from development and pollution and encourage wildlife activity through enforcement of existing state regulations, establishment of wetland zones and undertaking measures to eliminate pollution sources (similar to NYSDOS Policy 44).*

In general, any potential impacts to wetlands and wildlife are expected to be temporary. Information on existing wetlands, potential impacts, and proposed avoidance, minimization and/or mitigation measures are provided in Section 5. The Applicants construct the Facility in compliance with its wetland and waterways permits and approvals.

Town of Red Hook

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

Policy 7A - *Protect the areas identified as significant habitat areas by the NYSDOS as well as the creeks, kills, wetland and cove areas draining into and adjacent to the Hudson River from alteration and/or pollutant discharge by residential, commercial, agricultural or industrial uses in order to maintain their viability as habitat areas.*

There are three significant habitats in the Red Hook LWRP area: The Esopus Estuary, the Flats and North and South Tivoli Bays. Impacts to these areas will be avoided and/or minimized as described in Section 8.4.1.

Policy 23A - *Conserve, protect, preserve and, if appropriate, promote the adaptive reuse of places, sites, structures, views and features in the coastal area of the Town of Red Hook of* *special historic, cultural or archaeological significance or which by reason of association with notable people or events, or of the antiquity or uniqueness of architectural and landscape design particular significance to the heritage of the town.*

The construction of the buried cables will have no adverse affects on these resources.

Policy 38A - *Work to re-establish and maintain the Saw Killwater quality surveillance program.*

This local policy is not applicable as the Facility is not in proximity to this resource nor will it affect it.

City of Kingston

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

See policy 7A.

Policy 7A - *The Rondout Creek habitat shall be protected, preserved and, where practical, restored so as to maintain its viability as a habitat.*

Rondout Creek is a SCFWH recognized by NYSDOS with a significance value of 70.

This SCFWH will be avoided by the Facility.

Policy 7B - *The locally important habitat at Kingston Point Park, also known as K.E.4, shall be protected, preserved and, where practicable, restored so as to maintain its viability as a habitat.*

This mudflat freshwater wetland area will be avoided by the Facility.

Another SCFWH recognized by NYSDOS is the Kingston Deep Water habitat with a significance rating of 110. This six-mile-long habitat extends from the City of Kingston to Rhinecliff and varies in depth from 30 to 50 feet.

A detailed discussion of avoidance and/or minimization of potential impacts for the Kingston Deepwater habitat is provided in Section 8.4.1. Cable installation is not expected to result in a change in overall depths in the Kingston Deepwater Habitat, and sediment deposition beyond the trench is expected to be insignificant. BMPs will be employed during cable installation to avoid and/or minimize any potential impacts.

Town of Rhinebeck

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and, where practical, restored so as to maintain their viability as habitats.*

There are three recognized SCFWHs in the Town of Rhinebeck's LWRP area.

Policy 7A - *The Vanderburgh Cove and Shallows Habitat shall be protected, preserved, and, where practical, restored so as to maintain its viability as a habitat.*

Vanderburgh Cove and Shallows Habitat are SCFWHs recognized by NYSDOS with a significance rating of 20.

These areas will be avoided by the Facility.

Policy 7B *- The Kingston Deepwater Habitat shall be protected, preserved, and, where practical, restored so as to maintain its viability as a habitat.*

The Kingston Deep Water Habitat is recognized as a SCFWH by NYSDOS and has a significance rating of 110. This six-mile-long habitat extends from the City of Kingston to Rhinecliff and varies in depth from 30 to 50 feet.

A detailed discussion of avoidance and/or minimization of potential impacts for the Kingston Deepwater habitat is provided in Section 8.4.1. Cable installation is not expected to result in a change in overall depths in the Kingston Deepwater Habitat, and sediment deposition beyond the trench is expected to be insignificant. BMPs will be employed during cable installation to avoid and/or minimize any potential impacts.

Policy 7C *- The Flats Habitat shall be protected, preserved and where practical, restored so as to maintain its viability as a habitat.*

The Flats Habitat is a SCFWH recognized by NYSDOS with a significance rating of 118. This area is a four and one half mile long ridge running down the middle of the Hudson River. It is less than 10 feet deep at mean low water (MLW). The navigational channel runs down the Hudson River to the west of this area.

The Facility is not expected to cross this SCFWH (see Section 8.4.1).

Policy 7D *- Support efforts to protect and enhance the natural resources of Ferncliff Forest, Snyder Swamp and the Mudder Kill.*

These areas will not be affected by this Facility.

Policy 7E *- Protect the creeks, freshwater tidal wetlands, and freshwater tidal cove areas draining into and adjacent to the Hudson River from alteration and/or pollutant discharge by residential, commercial, agricultural or industrial uses.*

These areas will not be affected by this Facility.

<u>Town of Esopus</u>

Policy 7 *- Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.*

There are four SCFWH in the Town of Esopus LWRP area.

Policy 7A *- The locally important Kingston and Poughkeepsie deepwater habitats shall be protected and preserved so as to maintain their viability as habitats.*

Since this LWRP was adopted, these two areas have been recognized as SCFWHs

The Kingston Deep Water Habitat is recognized by NYSDOS and has a significance rating of 110. This 6-mile long habitat extends from the City of Kingston to Rhinecliff and varies in depth from 30 to 50 feet.

The Poughkeepsie Deep Water Habitat is recognized by NYSDOS and has a significance rating of 110. This habitat extends 14 miles from the Village of West Park to the Hamlet of Marlboro. Depths range from 30 to 50 feet with one area, Crum Elbow, having depths exceeding 125 feet.

A detailed discussion of avoidance and/or minimization of potential impacts for these SCFWHs is provided in Section 8.4.1. Cable installation is not expected to result in a change in overall depths in either the Kingston or Poughkeepsie Deepwater Habitats, and sediment deposition beyond the trench is expected to be insignificant. BMPs will be employed during cable installation to avoid and/or minimize any potential impacts.

Policy 7B - *The locally important Rondout Creek Habitat shall be protected and preserved so as to maintain its viability as habitat.*

Since the adoption of this LWRP, the Rondout Creek has been designated a SCFWH by NYSDOS with a significance value of 70.

This significant habitat will be avoided by the Facility.

Policy 7C - *The locally important Esopus Meadows Habitat shall be protected and preserved so as to maintain its viability as habitat.*

Since the adoption of this LWRP, Esopus Meadows Habitat has been recognized by the NYSDOS as a SCFWH with a significance rating of 71. Esopus Meadows is a shoal of approximately 350 acres.

This area will be avoided by the Facility.

Policy 7D - *The other identified local habitat "the map turtle basking rocks" shall also be protected from the adverse impacts of use or development.*

This area will be avoided by the Facility.

<u>Town of Poughkeepsie</u>

Policy 7 - *Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and, where practical, restored so as to maintain their viability as habitats.*

There are two SCFWHs in the Town of Poughkeepsie, the Poughkeepsie Deepwater Habitat and Wappinger Creek.

The Poughkeepsie Deep Water Habitat is recognized by NYSDOS and has a significance rating of 110. This habitat extends 14 miles from the Village of West Park to the Hamlet of Marlboro. Depths range from 30 to 50 feet with one area, Crum Elbow, having depths exceeding 125 feet.

Wappinger Creek is on the east side of the Hudson River between Poughkeepsie and Wappinger. It has a significance rating of 54.

This area will be avoided by the Facility.

Town of Lloyd

Policy 7 *- Significant Coastal Fish and Wildlife Habitats will be protected, preserved, and, where practical, restored so as to maintain their viability as habitats.*

See Policy 7A.

Policy 7A *- To preserve and protect the viability of the Poughkeepsie Deep Water Habitat and the Shortnose Sturgeon, which is considered an endangered species.*

The Poughkeepsie Deep Water Habitat is recognized by NYSDOS and has a significance rating of 110. This habitat extends 14 miles from the Village of West Park to the Hamlet of Marlboro. Depths range from 30 to 50 feet with one area, Crum Elbow, having depths exceeding 125 feet.

A detailed discussion of avoidance and/or minimization potential impacts for these SCFWHs is provided in Section 8.4.1. Cable installation is not expected to result in a change in overall depths in the Poughkeepsie Deepwater Habitat, and sediment deposition beyond the trench is expected to be insignificant. BMPs will be employed during cable installation to avoid and/or minimize any potential impacts. Potential impacts and avoidance and/or minimization measures for shortnose sturgeon are described in Section 9.1.

Policy 7B *- Protect, preserve and enhance the wooded bluffs of the Hudson River shore, which is habitat to the bald eagle (an endangered species), the osprey (threatened) and peregrine falcon as well as many other bird species.*

The Facility will avoid these areas.

Policy 8A *- Protect fish and wildlife resources in the waterfront area from any possible hazardous wastes and other pollutants which may be present anywhere within the waterfront area, including the Costantino Landfill.*

This Facility will have no impact on the immediate waterfront area and will not result in the disturbance of possible contaminated areas within the immediate waterfront area.

Policy 18A *- Safeguard the vital economic, social and environmental interests of the Town of Lloyd and its citizens in the evaluation of any proposal for an additional Hudson River crossing - either a new bridge or second deck - which would impact the town*

This local policy is not applicable to this Facility.

Policy 35A *- Spoils from dredging of the navigational channel of the Hudson River, or of any areas of the river or the coastline which may require it, shall not be disposed of in the Poughkeepsie Deepwater Habitat.*

If any dredge spoils result from this Facility, it will be disposed of in accordance with all state, federal and local requirements, and will not be disposed of in the Poughkeepsie Deepwater Habitat

<u>City of Beacon</u>

Policy 7A *- The Fishkill Creek Estuary and marsh shall be protected, preserved, and where practical, restored so as to maintain its viability as a habitat. This Significant Coastal Fish and Wildlife Habitat has a significance rating of 54 and consists of an 80 acre estuary. (West Point North map)*

This area will be avoided by the Facility.

Policy 8A *- Prohibit the discharge of untreated effluent and pollutants from commercial and industrial facilities along Fishkill Creek.*

This local policy does not apply to this Facility.

Policy 23A *- Encourage the restoration and adaptive reuse of large historic estates, such as the mill buildings on Fishkill Creek.*

The Facility does not involve the opportunity to restore or reuse large historic estates.

Policy 35A *- Dredging shall not occur during fish spawning season and will not be carried out without a U.S. Army Corps of Engineers Section 10 and/or 404 permit, and/or DEC Part 608 and 663 permits.*

The Facility will abide by specific conditions of issued USACE Section 10/404 and/or DEC Part 608 and 663 permits.

Policy 35B *- Spoils should not be deposited in wetlands or Significant Fish and Wildlife Habitats as identified in the LWRP inventory.*

Dredge spoil, as a result of this Facility, will disposed of in accordance with all state, federal and local requirements.

Policy 35C *- Reclamation of spoils sites, including landscaping, shall be conducted where it is practical to do so.*

This Facility does not involve the use of spoil sites, so reclamation is not applicable.

Policy 35D *- Groundwater contamination shall be avoided.*

The installation of the cables along the bottom of the Hudson River avoids areas of groundwater contamination.

Policy 35E *- Spoils site design will incorporate considerations for natural features, viewsheds, and shall, where feasible, conform to existing land form.*

Spoil site development is not a component of this Facility, and so this policy does not apply.

Policy 35F *- No deposition shall occur without testing of sample soils for toxicity.*

If dredging occurs within the limits of Beacon, dredge spoil will most likely be removed for proper disposal rather than deposited back in the trench.

Policy 35G - *Toxic or hazardous dredge spoils shall not be deposited within the waterfront boundary. The potential of worked out mines as dredge spoil sites will be investigated.*

Dredge spoil, as a result of this Facility, will disposed of in accordance with all state, federal and local requirements.

Policy 44A - *Preserve and protect the Fishkill Creek Marsh to maintain its many intrinsic values.*

Fish Creek Marsh is recognized as a SCFWH and has a significance rating of 54 and consists of an 80-acre estuary.

This area will be avoided by the Facility.

City of Newburgh

Policy 7A - *Activities that would adversely affect fish resident in or migrating through waters adjacent to Newburgh will be avoided.*

The Applicants will comply with this local policy by avoiding and/or minimizing impacts to fisheries, as described in Section 7.

Policy 8A - *New developments or expansion of existing facilities will not be permitted if such facilities introduce hazardous wastes or other pollutants into the environment or if they are unable to acquire the necessary state, federal, and local permits.*

This Facility does not anticipate introducing hazardous wastes or other pollutants into the environment since the cables do not contain these substances, and cables are the only feature proposed for placement within the City of Newburgh.

Policy 18A - *Maintain and improve existing low and moderate income housing.*

This local policy is not applicable to this Facility.

Policy 23A - *No changes in any exterior architectural feature, including, but not limited to, construction, alteration, restoration, removal, demolition, or painting, shall be made to identified resources except as hereinafter provided.*

This local policy is not applicable to this Facility.

Policy 44 - *Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas. (Similar to NYSDOS Policy 44.)*

In addition to avoiding most tidal wetland habitats as described in Section 5, this Facility will specifically avoid Quaissaick Creek tidal wetland, which is noted as locally important.

City of Peekskill

***Policy 7A** - Fish and wildlife habitats of local importance are of value to the city and its natural resource inventory and shall be protected, preserved and, where practical, restored so as to maintain their viability.*

This local policy refers to Camp Smith Marsh, Annsville Creek, Peekskill Hollow Brook and the McGregory Brook, as well as Nose and Bald Mountains north of the city.

These habitats of local significance are not in proximity to the route and will not be impacted by this Facility.

Town of Stony Point

***Policy 7A** - The Iona Island Marsh shall be protected, preserved and, where practical, restored so as to maintain its viability as a habitat.*

The Iona Island Marsh has a significance value of 71. It is comprised of approximately 270 acres of freshwater, tidal and brackish wetlands.

This area is along the west side of the Hudson River and will be avoided by this Facility.

***Policy 7B** - The Haverstraw Bay habitat shall be protected, preserved and, where practical, restored so as to maintain its viability as a habitat.*

Haverstraw Bay is a significant habitat with a significance value of 166. The bay encompasses a six-mile stretch of the Hudson River from Stony Point to Croton Point. Average depth at MLW is approximately 15 feet. Salinity in the area varies by year, but Haverstraw Bay is an important habitat for fish nurseries. The navigational channel is located on the west side of the bay and maintained at approximately 35 feet in depth. The Applicants will by-pass Haverstraw Bay with an overland route.

***Policy 7C** - The Hudson River Mile 44 - 56 habitat shall be protected, preserved and, where practical, restored so as to maintain its viability as a habitat.*

This significant habitat runs from Cornwall Bay to Peekskill Bay. It is a 12-mile-long deep-water habitat reaching depths of up to 200 feet. The bay has strong currents and a rocky substrate. It is considered the southernmost extent of freshwater in the Hudson River and is an important spawning area.

Detailed information on the avoidance and/or minimization of potential impacts are provided in Section 8.4.1. Cable installation is not expected to result in a change in overall depths, and sediment deposition beyond the trench is expected to be insignificant. BMPs will be employed during cable installation to avoid and/or minimize any potential impacts. In addition, the NYSDEC has identified those areas of particular significance within this resource area and these zones will be avoided to the maximum extent possible based on sound engineering.

***Policy 23A** - Stabilize and revitalize the historic residences and neighborhoods on River Road, Munn Avenue and Grassy Point Road.*

This Facility is not located in or near these areas and will have no affect on these resources, and so this policy is not applicable.

Village of Haverstraw

Policy 7A - *The Haverstraw Bay Habitat shall be protected, preserved and where practical, restored so as to maintain its viability as habitat.*

The Applicants have routed the cables overland to avoid adverse impacts to this habitat.

Policy 8A - *Control the introduction of new industries or technology which could increase the presence of hazardous materials within the Haverstraw coastal area.*

This Facility will not have an effect on this local policy.

Policy 8B - *Encourage existing industrial productions or storage facilities to utilize the most current technologies available to minimize the potential threat from hazardous wastes or pollutants to the surrounding environment.*

This local policy does not pertain to this Facility. The Facility will employ Best Management Practices, including a SPCC Plan or its equivalent, to avoid and/or minimize the threat of releases of hazardous materials during construction.

Policy 23A - *Stabilize and revitalize the historic residences and neighborhoods on First Street and Hudson Avenue as well as other selected areas.*

This local policy does not pertain to this Facility.

Policy 23B - *Preserve and protect underwater historic, archaeological and cultural resources in Haverstraw Bay.*

The Applicants have routed the cables overland to avoid adverse impacts to this habitat.

Village of Croton-on-Hudson

Policy 7A - *The quality of the Croton River and Bay Significant Fish and Wildlife Habitat and Haverstraw Bay Significant Fish and Wildlife Habitat shall be protected and improved for conservation, economic, aesthetic, recreational, and other public uses and values. Its resources shall be protected from the threat of pollution, misuse, and mismanagement.*

Croton River and Bay is a significant habitat with a significance value of 24. The bay is comprised of approximately 1,200 acres of submerged aquatic vegetation and mudflats and is located at the southeastern edge of Haverstraw Bay. Most of the Croton River has been diverted for public water supplies.

This area will be avoided by the Facility.

Haverstraw Bay is a significant habitat with a significance value of 166. The bay encompasses a six-mile stretch of the Hudson River from Stony Point to Croton Point. Average depth at MLW is approximately 15 feet. Salinity in the area varies by year, but Haverstraw Bay is an important habitat for fish nurseries. The navigational channel is located on the west side of the bay and maintained at approximately 35 feet in depth. The Applicants will by-pass Haverstraw Bay with an overland route.

Policy 7B - *Materials that can degrade water quality and degrade or destroy the ecological system of the Croton River and Bay Significant Fish and Wildlife Habitat and the Haverstraw Bay Significant Fish and Wildlife Habitat shall not be disposed of or allowed to drain in or on land within the area of influence in the Significant Fish and Wildlife Habitats.*

No materials will be disposed of or allowed to drain into the Croton River and Bay SCFWH or the Haverstraw Bay SCFWH. The Facility will be constructed by employing BMPs, including an SPCC Plan or its equivalent, which will be provided in the EM&CP.

Policy 7C - *Storage of materials that can degrade water quality and degrade or destroy the ecological system of the Croton River and Bay Significant Fish and Wildlife Habitat or Haverstraw Bay Significant Fish and Wildlife Habitat shall not be permitted within the area of influence of the habitat unless best available technology is used to prevent adverse impacts to the habitat.*

This Facility will not require the storage of materials that could degrade water quality or degrade or destroy the ecological system of the Croton River Haverstraw Bay SCFWHs.

Policy 7D - *Restoration of degraded ecological elements of the Croton River and Bay and Haverstraw Bay Significant Fish and Wildlife Habitat and shorelands shall be included in any programs for cleanup of any adjacent toxic and hazardous waste sites.*

This local policy does not apply to the Facility.

Policy 7E - *Runoff from public and private parking lots and from storm sewer overflows shall be effectively channeled so as to prevent oil, grease, and other contaminants from polluting surface and ground water and impact the Significant Fish and Wildlife Habitat.*

This local policy does not apply to the Facility.

Policy 7F - *Construction activity of any kind must not cause a measurable increase in erosion or flooding at the site of such activity, or impact other locations. Construction activity shall be timed so that spawning of anadromous fish species and shellfish will not be adversely affected.*

Sediment and erosion control BMPs will be employed to avoid and/or minimize impacts outside of the construction area from erosion or stormwater. The buried cables will not measurably alter the riverbed elevation, thereby avoiding any possibility of increasing flooding or erosion. Construction activity will be timed to avoid and/or minimize impacts to fish spawning as described in Sections 7 and 8.

Policy 7G - *Such activities must not cause degradation of water quality or impact identified Significant Fish and Wildlife Habitats.*

This Facility will be constructed with BMPs in place that will avoid and/or minimize the potential for water quality impacts, other than localized and temporary increases in suspended sediment concentrations around the water jetting device (see Section 6).

Impacts to identified SCFWHs have either been avoided and/or minimized through cable routing or through the selection of jetting as the preferred burial method (see Section 8).

Policy 44A - *Wetlands, waterbodies and watercourses shall be protected by preventing damage from erosion or siltation, minimizing disturbance, preserving natural habitats and protecting against flood and pollution.*

The Applicants expect to avoid impacts to wetlands along the underwater portions of the transmission cables (see Section 5) and will avoid and/or minimize siltation and other disturbances associated with the Facility. Section 1 provides details on the proposed construction methods, which allow for rapid cable laying and burial to avoid and/or minimize the re-suspension of sediments.

Village of Ossining

Policy 7A - *The designated coastal habitat at the Croton River and Bay shall be protected, preserved, and where practicable, restored so as to maintain its viability as habitat.*

Croton River and Bay is a significant habitat with a significance value of 24. The bay is comprised of approximately 1,200 acres of submerged aquatic vegetation and mudflats and is located at the southeastern edge of Haverstraw Bay. Most of the Croton River has been diverted for public water supplies.

This Facility will avoid Croton Bay significant habitat.

Policy 7B - *The locally important coastal wildlife habitat at Crawbuckie Nature Area shall be protected and preserved so as to maintain its viability as a habitat.*

The Crawbuckie Nature Area is east of the Croton Bay significant habitat and will be avoided by this Facility.

Village of Nyack

Policy 7A - *Protect the physical characteristics of the Hudson River along Nyack that support the varied fish populations found there. Nyack's LWRP notes that numerous species of fish are found in this area and implemented this local policy to protect them.*

This Facility will not alter the physical characteristics of the Hudson River, other than temporary increases in suspended sediments, and a linear trench of fluidized sediments that will require some time to re-compact (see Section 6).

Village of Sleepy Hollow

Policy 7A - *Fremont Lake and associated wetlands/watercourses and adjacent upland areas shall be protected, preserved, and, where practical, restored so as to maintain its viability as a locally significant habitat.*

Fremont Lake and its associated wetlands/watercourses and adjacent upland areas are not near nor will they be affected by this Facility.

***Policy 7B** - The Philipsburg Manor and Devries Field wetland/watercourse areas of the Pocantico River shall be protected, preserved, and, where practical, restored so as to maintain its viability as a locally significant habitat.*

These areas are not near nor will they be affected by this Facility.

***Policy 7C** - The Upper Pocantico River and Gorey Brook watercourse areas shall be protected, preserved, and, where practical, restored so as to maintain its viability as a locally significant habitat.*

These areas are not near nor will they be affected by this Facility.

***Policy 7D** - The Hudson River immediately adjacent and within 1,000 feet of the village's shoreline shall be protected, preserved, and, where practical, restored so as to maintain its viability as a locally significant habitat.*

Installation of the cables will either occur greater than 1,000 feet from the village's shoreline at this location or will involve only temporary impacts to the riverbed.

***Policy 7E** - The lands in state ownership associated with the Rockefeller State Park Preserve and Old Croton Aqueduct Trail shall be protected, preserved, and, where practical, restored so as to maintain its viability as a locally significant habitat.*

These areas are not near nor will they be affected by this Facility.

***Policy 8A** - Control the introduction of new industries or technology which could increase the presence of hazardous materials within the Sleepy Hollow waterfront area.*

This Facility only involves the installation of HVDC cables within the Village boundaries, without the potential to increase the presence of hazardous materials.

***Policy 8B** - Encourage existing industrial production or storage facilities to utilize the most current technologies available to minimize the potential threat from hazardous wastes or pollutants to the surrounding environment.*

This Facility does not involve industrial or storage facilities.

***Policy 18A** - Protect the vital economic, social, cultural, and environmental interests of the village in the evaluation of any proposal for new roads, road widening or infrastructure.*

This local environmental policy is not applicable to this Facility.

***Policy 18B** - To protect the social interests of the village, proposed actions must give full consideration to the impacts of such actions on the community and cultural resources of the village and the quality of life such resources support.*

With the cables being located in the bottom of the Hudson River, this Facility will not impact the cultural resources of the village or the quality of life such resources support.

Policy 18C - *To protect the environmental interests of the village, proposed actions must give full consideration to the impacts of such actions on valuable and sensitive natural resources of the village.*

This Facility will have an insignificant impact on certain resources (e.g., water quality, fisheries, benthos) of the Hudson River other than temporary impacts to the riverbed. Since the native sediments backfill the trench, the impacted area represents an insignificant fraction of the total area of the riverbed, and the increased suspended sediments are temporary and localized, a rapid recovery is expected.

Policy 23A - *Preserve and enhance the structures, areas, or sites within the Village of Sleepy Hollow that are currently listed on the state and/or national register of historic places.*

This local policy is not applicable to this Facility since none of these resources will be altered or disturbed during cable installation.

Policy 23B - *Preserve and enhance the structures, areas, or sites within the Village of Sleepy Hollow that have been identified as being eligible for listing on the state and/or national register of historic places.*

This local policy is not applicable to this Facility since none of these resources will be altered or disturbed during cable installation.

Policy 23C - *Encourage the restoration and adaptive reuse of historic buildings such as the Philipse Manor Train Station.*

This local policy is not applicable to this Facility since none of these resources will be altered or disturbed during cable installation.

Village of Piermont

Policy 7A - *Protect the Piermont Marsh south of the pier and the Sparkill Creek by severely restricting it to passive recreational uses.*

Piermont Marsh is a SCFWH with a significance value of 74. It is a 725-acre tidal wetland located along the west side of the Hudson River. The Sparkill Creek empties into this wetland area.

This area will be avoided by the Facility.

Policy 8A - *The intentional dumping of oil or other pollutants into waterways and catch basins can be harmful to fish and wildlife resources, and such actions will be prosecuted.*

The Applicants or its contractors will not intentionally dump oil or other pollutants into the Hudson River.

Policy 8B - *The Rockland County sewer outfall line should be extended to deeper, faster flowing water. The outfall line should be rebuilt to maintain its integrity.*

This local policy is not applicable to this Facility since it does not involve activities that require the use of the sewer, or otherwise warrant the Applicants involvement in this endeavor.

Policy 18A - *New development shall be designed to minimize impact on the availability of affordable housing and on the existing character and cultural resources of Piermont.*

The buried cables of this Facility are consistent with this local policy.

Policy 23A - *The architectural review board shall review applications for building permits involving structures identified as being architecturally significant or structures adjacent to buildings or sites identified as historically or architecturally significant.*

This local policy is not applicable to this Facility.

Policy 23B - *Place monuments and markers on structures and at sites important to the history of the Village of Piermont.*

This local policy is not applicable to this Facility.

Policy 44A - *The Piermont Marsh should be protected from pollutants that would adversely affect the ecology of the marsh.*

Piermont Marsh will be avoided and potential impacts will be avoided and/or minimized by this Facility by the construction methods selected and BMPs, and the environmental protection measures to be employed during construction, such as implementation of BMPS and an SPCC Plan or its equivalent for the vessels installing the cables.

Village of Dobbs Ferry

The numbering of the policies for Dobbs Ferry differ from the numbering of these policies by NYSDOS. All policies have been reviewed and it has been determined that this Facility will be consistent with the policies that are applicable. Specific policies are as follows:

Policy 6.1 - *Protect locally significant coastal fish and wildlife habitats.*

This Facility will avoid and/or minimize impacts to SCFWHs to the greatest extent possible, both by the location of the cable route in the deeper waters of the Hudson River, and the use of water jetting to bury the cable, which allows for faster burial than conventional dredging and so the duration and extent of suspended sediments is reduced, and the initiation of recovery of the riverbed occurs sooner.

Policy 6.2 - *Support the restoration of Significant Coastal Fish and Wildlife Habitats wherever possible so as to foster their continued existence as natural, self-regulating systems.*

While not directly related to this Facility, this Facility will not conflict with or prevent restoration activities.

Policy 10.5 *- Promote the efficient management of surface waters and underwater lands.*

This Facility will conform to this policy because of the selected location and proposed construction methods, thereby avoiding more ecologically sensitive areas and greater levels of impacts to these resources compared to other types of cable installation procedures.

New York City

New York City's LWRP policies differ in numbering sequence. All policies have been reviewed and it has been determined that this Facility will be consistent with the policies that it might have an impact on.

Policy 1 *- Support and facilitate commercial and residential redevelopment in areas well-suited to such development.*

The Hell Gate Bypass, Luyster Creek converter station, and interconnection to the Astoria and Rainey substations are consistent with existing zoning and will not permanently affect commercial or residential development in the area.

Policy 2 *- Support water-dependent and industrial uses in New York City coastal areas that are well-suited to their continued operation.*

The underground Facility will not conflict with the LWRP's goal of fostering the continuation of water-dependent uses. Installation of buried cable in the Hudson River will require the use of a port facility and marine construction equipment, personnel and vessels.

Policy 3 *- Promote use of New York City's waterways for commercial and recreational boating and water-dependent transportation centers.*

The Facility will not conflict with the LWRP's goal of promoting use of New York City's waterways for commercial and recreational boating and water-dependent transportation centers, as the cables will be buried.

Policy 4 *- Protect and restore the quality and function of ecological systems within the New York City coastal area.*

The underwater and underground transmission cable will not affect the quality and function of ecological systems within the New York City coastal area. The water jetting cable installation method allows for *in situ* backfilling of the trench following a brief period of disturbance. The benthic community, associated fish, and water quality will all recover following construction.

Policy 5 *- Protect and improve water quality in the New York City coastal area.*

The cables and converter station will be installed in a manner that protects water quality (see Section 6). The Applicants will develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for control of construction stormwater and will implement appropriate spill control, prevention, and mitigation in order to ensure protection of water quality in the New York City area.

Policy 6 - *Minimize loss of life, structures, and natural resources caused by flooding and erosion.*

The underwater cable installation will not alter the riverbed elevation and will have no effect on flooding characteristics of the river. Section 5.1.2 provides more information on floodplains in the vicinity of the route.

Policy 7 - *Minimize environmental degradation from solid waste and hazardous substances.*

Any solid waste or hazardous substance associated with construction or operation of the Facility will be used, stored, and disposed of in accordance with local, state, and federal requirements. The Applicants implement appropriate spill control and clean-up in order to avoid and/or minimize environmental degradation from accidental spills of fuel, oil or other hazardous materials that may be used during construction.

Policy 8 - *Provide public access to and along New York City's coastal waters.*

The connection to the Luyster Creek will be underwater or underground and will not conflict with the LWRP’s goal of providing public access to and along New York City’s coastal waters. The Harlem River and East River shoreline crossings will involve cable installation via HDD methods, which do not alter public access. The interconnection to the Astoria Site may be overhead but this approach would not interfere with public access.

Policy 9 - *Protect scenic resources that contribute to the visual quality of the New York City coastal area.*

The transmission cables in New York City will be buried underground or underwater and therefore will not be visible. The Luyser Creek converter station will be designed to match the character of the surrounding area, which includes utility systems, and is not expected to have an adverse impact on any scenic resources. The interconnection to the Astoria and Rainey substations will not involve overhead lines. Therefore, there is not expected be any effect on the visual quality of the New York City coastal area. Section 11 provides additional information on visual resources.

Policy 10 - *Protect, preserve, and enhance resources significant to the historical, archaeological, and cultural legacy of the New York City coastal area.*

The Applicants will avoid and/or minimize any impacts to any underwater historical, archeological, and cultural resources along the underwater portions of the transmission cable route as described in Section 10.

2.5.2.2 Consistency with Harbor Management Plans

There are four communities along the Facility’s cable route that have Harbor Management Plans. These communities include the Town of Essex, Village of Sleepy Hollow, Village of Piermont, and Village of Dobbs Ferry. The Harbor Management Plans were reviewed to ensure the Facility is consistent with any applicable requirements.

Town of Essex

The Town of Essex has regulations governing the harbor and a Harbormaster:

- Anchoring for more than 72 hours will require a permit from the Harbormaster. Lights must be displayed if the vessel is not in a designated anchorage.
- There is a public anchorage off the Hamlet of Essex and in Whallons Bay.
- Permits for docks must be issued by the Harbormaster and must be in compliance with the zoning law. Permits will be issued only to persons with riparian property interests.
- Town Board shall have the power to establish standard contracts and contract terms and fees for the rental of public wharves, slips, docks, and moorings.
- There is a ferry dock and what appear to be commercial docks and marinas located with access to the navigational channel.

Installation of the HVDC cables in Lake Champlain will be consistent with the Town of Essex's Harbor Management Plan. Local permits and approvals are not required per Public Service Law §130.

Village of Sleepy Hollow

The Village of Sleepy Hollow's Harbor Management Plan is found in Sections II and IV of the village's LWRP. This harbor management plan calls for increased access to and usage of the waterfront. Water-dependent uses of the waterfront are also encouraged. To this end the Village of Sleepy Hollow adopted zoning laws that include a waterfront redevelopment district.

Installation of the HVDC cables in Hudson River will be consistent with the Village of Sleepy Hollow's Harbor Management Plan.

Village of Piermont

The Village of Piermont has a section in their LWRP called Harbor Management Needs. Information includes the following:

- The marinas and piers are becoming inaccessible due to shallow water. Shallow water is a result of siltation that has occurred in the last 30 years after the Tappan Zee Bridge was built.
- Dredge spoil in this area, at the time of the LWRP's adoption, was approved as a landfill cover for the Town of Clarkstown landfill.
- The plan also calls for the removal of several sunken barges and a sunken ferry in the harbor area.

Installation of the HVDC cables in the Hudson River will be consistent with the Village of Piermont's harbor management plan.

<u>Village of Dobbs Ferry</u>

This Harbor Management Plan is spread throughout the LWRP. It deals mainly with development options for the harbor. Details include the following:

- Water depth off of the Village of Dobbs Ferry is from 1 to 5 feet. The Hudson River navigational channel is 200 feet off shore. A great deal of dredging would be necessary to establish a marina or dock off the Village of Dobbs Ferry.
- Upstream development is believed to be increasing the sediment loads in Wickers Creek and the Saw Mill River leading to increased siltation along the Dobbs Ferry coastline.

Installation of the HVDC cables in Hudson River will be consistent with the Village of Dobbs Ferry's Harbor Management Plan.

2.6 Avoidance and/or Minimization of Potential Impacts

This section addresses the potential impacts on existing and future land uses from construction and operation activities, along with any proposed avoidance and/or minimization measures for impacts to land use. Most of the route is located underwater, with little potential impact to public or private property, open space, or any existing or planned land uses. Along the underground portions of the route, impacts to land use have been avoided and/or minimized by routing along existing disturbed railroad ROWs to the extent possible. Underwater segments are expected to have an insignificant impact on land use, since water-dependent uses, navigation and other coastal uses will not be affected.

2.6.1 Impact Assessment

2.6.1.1 Land Use

Along the terrestrial portions of the route, impacts to land use have been avoided and/or minimized by routing within and along existing disturbed railroad and roadway ROWs to the extent possible. The routing configuration is outside of these ROWs when it is necessary to cross municipal-owned roadways, to avoid sensitive habitat, or when it is necessary to avoid engineering constraints such as bridge abutments or existing structures. The routing design has also been modified from the original proposed configuration so as to avoid and/or minimize impacts to planned land uses, such as the expansion of the railroad system at the City of Saratoga Springs and Village of Ballston Spa and planned construction along Erie Boulevard in the City of Schenectady.

During construction, it is anticipated that there will be temporary impacts to existing and planned land uses. Construction along Route 22 will need to allow for safe travel by motorist and bicyclists. Plans to expand the LaFarge cement plant adjoining the CSX ROW in Village of Ravena will need to be reviewed to ensure capability, as will the Quiet Zone railroad crossing improvements in Rockland County. Traffic patterns along Route 9W in Town of Clarktown will be slowed due to the construction occurring within this right-of-way and there will be increased ambient noise along public areas such as the soccer fields adjoining the CSX ROW in the Town of Catskill. However, all of these impacts will be of a relatively short duration and are only associated with construction phase.

The Applicants will coordinate closely with CP and CSX prior to finalizing the location of the proposed cable to ensure each railroad's future development plans are considered. Close coordination with the railroad companies during the equipment delivery and installation stages of the Facility will assist in avoiding or minimizing conflict with ongoing railroad operations. The majority of the underground bypass of southern Lake Champlain is within the existing New York State Route 22 ROW. Route 22 is classified as a State Highway and as such the Applicants will obtain the appropriate approvals from the New York Department of Transportation (NYSDOT) and follow all substantive requirements.

Outside of the larger population centers such as the City of Saratoga Springs, the City of Schenectady and the Town of Rotterdam, underground portions of the cable route traverse sparsely populated areas and land uses that consist primarily of forest land, commercial/industrial/transportation, and open space. Minimal clearing of trees and vegetation will be required. Nearby residences may experience temporary disturbance and traffic inconvenience associated with construction activities, primarily at locations where the existing ROWs cross public roadways that will be used by construction vehicles to access the ROW. These effects will be temporary and, in general, most disturbances will last only a brief period of a few days or a week at any particular location.

The Astoria-Rainey Cable will travel along roadways with the borough of Queens, New York. In addition to the local parks identified in Section 2.3.9 above, the Applicants have also identified that the route would be located adjacent to three schools and in the vicinity of other social features such as a library and senior center. While the installation of the cables will temporarily disrupt business and land uses as well as traffic, the Applicants have committed to addressing these concerns in the Environmental Management and Construction Plan ("EM&CP") designed for this portion of the Facility.

To minimize potential construction effects to adjacent landowners, the Applicants will provide timely information to adjacent property owners and/or tenants regarding the planned construction activities and schedule. The majority of the terrestrial portion of the route follows existing CP and CSX railroad ROWs and to a lesser extent NYS Route 22 and other road ROWs. Close coordination with the railroad companies, the NYSDOT and local municipal highway departments during the equipment delivery and installation stages will assist in avoiding or minimizing conflict with ongoing operations and uses. Coordination will also be necessary with NYSDOT county officials in Washington, Saratoga, Schenectady, Albany, Greene, Rockland, and New York Counties, and local police departments, as applicable, to develop and implement traffic control measures that ensure safe and adequate traffic operations along roadways used by construction vehicles.

Recreational use of the New York State waters by recreational boaters and shoreline fishing will not be significantly affected by installation of transmission cables. The impacts of cable laying vessels are expected to be temporary for the duration of construction and construction-related activities only. The installation of the cables and converter station is not expected to prevent the location of recreational and public access opportunities in the future, including the waterfront access projects of the South Bronx Greenway and the City of New York's Vision 2020 plan. The Facility design could accommodate installing the cables along the proposed route of the Champlain Canalway Trail within Whitehall so that post-construction restoration activities facilitate the development of the recreational path, although the decision to pursue this option would need to occur at a later point.

2.6.1.2 Agricultural Lands

The Facility is located in proximity to several designated Agricultural Districts in Washington, Saratoga, Schenectady, Albany and Greene counties (see Table 2-3). Where installation work is within the existing rail ROW, it is not anticipated that any agricultural operations will be disrupted. Potential impacts to agriculture land may occur if agricultural land is used for off-ROW access to the Facility or if agriculture lands are used for laydown areas. These areas will be identified during the development of the EM&CP Plan and Profile drawings. If the Facility identifies areas that may pose a risk to agriculture lands or operations, an Agricultural Inspector will be employed by the Applicants to oversee the agricultural resources traversed by the Facility. Best Management Practices will be in place to govern clearing, grading, and restoration activities. A monitoring and remediation program will be in place for a period of two (2) years after the completion of the initial restoration.

2.6.1.3 State and Local Parks/Public Lands

Impacts to state and local parks or public lands as a result of the cable and converter station installation are anticipated to be insignificant. Although the routing is proximal to some parks and other public lands, the only impact will be the installation of cables beneath Rockland Lake State Park and Hook Mountain State Park via HDD. Because the transmission cables will be entirely underground with no visible aboveground structures, there will be no permanent visual impacts to these public lands. Vegetation clearing along the railroad ROWs could cause minor aesthetic impacts by removing some vegetation that serves as visual screening for the railroad. These impacts are expected to be minor and temporary, since natural revegetation will be permitted to occur within most of the construction zone and any additional work spaces. Additional temporary impacts to adjacent public lands might occur if any recreational users are bothered by any unwanted noise, traffic, or disturbance due to construction along the railroad ROW. Since construction will generally move quickly along the construction zone, any impacts from noise or traffic which may affect public access will be short-term. The Applicants will avoid and/or minimize impacts to adjacent public lands by using appropriate BMPs to prevent erosion or sedimentation outside of the work limits and by limiting vegetation clearing to the extent possible. The routing is not expected to have any permanent impacts on recreation or public access (see Section 2.6.1.1).

Because the Luyster Creek converter station site is within an existing urban and developed environment, the Facility is not expected to adversely affect land uses or visual aesthetics adjacent to this aboveground structure. As discussed in Section 2.2, the Facility will be consistent with local open space and public land planning.

2.6.2 Avoidance and/or Minimization

Impacts to local or regional land uses, land use planning, or any federal, state, or local public lands from construction of the transmission cables and converter station are anticipated to be insignificant. The routing does not conflict with existing comprehensive county or town plans or LWRPs. Avoidance and/or minimization measures for land use impacts is built into the siting of the cable construction corridor and the selection of various construction methods.

3.0 GEOLOGY, TOPOGRAPHY, AND SOILS

This section provides an overview of the geologic setting for the Facility within New York State and specifically describes the existing surficial geology, topography and soils present along the underground portion of the route, and the Luyster Creek converter station site. This section also discusses the potential impacts to geology and soils that may result from the construction and operation the Facility, along with the methods that will be used to avoid and/or minimize those potential impacts. Section 6 describes the existing conditions along the underwater portion of the Facility, specifically describing bathymetry and sediment physical and chemical characteristics to be encountered, and plans for confirmatory underwater geotechnical investigations. Potential impacts and avoidance and/or minimization measures along the underwater portion of the Facility are also presented in Section 6.

3.1 Existing Conditions

3.1.1 Geologic Setting

The underground and underwater portions of the Facility are located in the Champlain section of the St. Lawrence Valley province to the north, extending south to the Hudson Valley section of the Valley and Ridge province, and finally to the Embayed section of the Coastal Plain province.

During the last continental glaciation, glaciers modified the regional topography by smoothing off hilltops, scouring out some valleys and filling in others, then leaving a mantle of unconsolidated material over the land surface in the Facility. This occurred during the last continental glaciation, advancing through the region approximately 20,000 years ago, and ending approximately 14,000-12,000 years ago. The retreat of glacial ice and the formation of glacial lakes in the Facility area valleys contributed to the deposition of unconsolidated material that will be encountered during the proposed construction (NYSMGS 1991).

3.1.2 Topography

The topography along the underground transmission cable corridor is generally flat to gently sloping at proposed valley bottom locations. The underground cable corridor generally follows anthropogenically disturbed corridors along railroad or roadway rights-of-way that have been altered by factors such as soil fill and grading for the railroad embankment. The approximate range of topographic elevations (above mean sea level) along the proposed underground cable corridor is from 450 feet along the northern reaches to near sea-level entering and exiting the

Hudson River. The elevation at the Luyster Creek converter station site is approximately 15 feet (GoogleEarthWin 2011).

3.1.3 Soils

Table 3-1 presents the soils that exist along the underground transmission cable corridor and at the Luyster Creek converter station site. Existing soils include native soils and urban fill and urban land.

The native soils formed from parent material related to glacial tills, glacial lake sediments, outwash and outwash delta deposits and more recent alluvium. Drainage along the underground route ranges from poorly to excessively drained. Hydric soils, those soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper zone, are present intermittently along the route. Frequent flooding, where the soils are temporarily covered with flowing water more than 50 times in 100 years, is present but not common along the route (USDA NRCS 2010a; USDA NRCS 2010b).

The underground portions of the route are located within or immediately adjacent to the existing CP and the CSX and Route 22 rights-of-way. There is also a short traverse in the Bronx along a CSX right-of-way and from the Luyster Creek converter station to the Rainey substation the facility will be located within CNY street ROW.

Along the railroad rights-of-way and the terrestrial route in New York City, some mapped soil types may not reflect actual field conditions due to previous rights-of-way and waterfront development. At several locations, including the Luyster Creek converter station, the material is urban land (USDA NRCS 2010b).

Agricultural protection districts identified along the proposed underground transmission cable corridor are discussed in Section 2.

3.1.4 Surficial Geology

Table 3-2 summarizes surficial material that will be encountered along the underground transmission cable corridor. A description of the material to be encountered during construction is presented below (NYSMGS 1989; NYSMGS 1990; NYSMTC 1999a):

- Lacustrine beach deposits contain well sorted sand and gravel. The material is well drained, stratified, permeable, and may contain wave-winnowed gravel deposits. The thickness is variable 3 to 15 feet.
- Lacustrine delta is a sand and fine to coarse gravel deposit, stratified, generally well sorted. The thickness is generally 10 to 50 feet.
- Lacustrine silt and clay is generally a laminated silt and clay deposit, with low permeability and potentially unstable. The thickness is variable up to 150 feet.
- Lacustrine sand is generally a quartz sand, well sorted, stratified, and permeable. The thickness generally ranges from 6-60 feet.

- Kame deposits consist of coarse to fine gravel and/or sand, with lateral variability in sorting, texture, and permeability. The thickness is variable at 30-90 feet.
- Marine beach deposits contain well sorted sand and gravel that is permeable and well drained. The thickness is 3 to 15 feet.
- Recent alluvium contains oxidized fine sand to gravel and may be overlain by silt. The material is permeable and is generally 3 to 30 feet thick.
- Till is a variable texture material from silt to boulders. The material is poorly sorted and sand rich. The material will have variable permeability and a thickness of 3 to 150 feet.
- Limited kame deposits will be encountered. The material will be fine to coarse gravel or sand. Sorting, texture, and permeability will be variable laterally and may be firmly cemented with calcareous cement. Thickness will generally vary from 30 to 90 feet.
- Outwash sand and gravel contains stratified fine to course gravel with sand.
- Wind deposited sand is a fine to medium sand, well sorted, stratified and well drained. Thickness varies from 3-30 feet.

Where bedrock is known to be exposed or generally within 3 feet of the surface it is presented on Table 3-2.

3.1.5 Bedrock Geology

Table 3-3 summarizes areas where bedrock may be encountered along the transmission cable corridor during trench excavation or HDD. A description of the bedrock is presented below.

Mixed gneiss is present as a hybrid rock of mangeritic to charnockitic gneiss. Gneiss is a common bedrock in the northern portion of the Facility area. Other metamorphic rock sequences that may be encountered in the northern portion of the route include: biotite-quartz-plagioclase paragneiss, amphibolite, migmatite, calcitic and dolomitic marble, Inwood marble, and pyroxene-hornblende-quartz-plagioclase gneiss (NYSMTC 1999b).

To the south along the Hudson River Valley, bedrock in the area includes: biotite-quartz-fieldspar paragneiss and hornblend granite and granite gneiss; the metasedimentary Austin Glen formation containing limestone clasts; and, the metamorphosed Schenectady Formation composed of greywacke, sandstone, siltstone, and shale (NYSMTC 1999b).

Mixed within these formations along the route is the Potsdam sandstone. Potsdam sandstone contains up to 97 percent silica and can be a valuable mineral resource. No recent or active mines were identified along the transmission cable corridor.

Canajoharie Shale is a fine-grained rock originating from mud. This shale is black and is common in the Champlain and Hudson River Valleys. Normanskill shale is also found in the Hudson River Valley, but is a minor mudstone and sandstone (NYSMTC 1999b).

Approaching New York City, the types of bedrock present are more complex, with a mix of limestone, plagioclase feldspar (Palisades Sill), Fordham Gneiss, Inwood Marble, Harrison Gneiss, pelitic schist (Manhattan Formation). Along the last landfall Fordham Gneiss is present, with a transition to a mica-quartz schist, granite, and amphibolites (Hartland Formation) at the Luyster Creek converter station area (NYSMTC 1999b).

No natural gas bearing formations were identified along the corridor.

3.1.6 Seismic Hazard

During an earthquake, seismic waves travel out from an earthquake epicenter through the surrounding rock. Ground motion is higher closer to the epicenter. In general, ground motion decreases away from the epicenter, though the amount of ground motion at the surface is related to more than just distance from the epicenter. Some natural materials can amplify ground motion; that is, ground motion is typically less on solid bedrock and greater on thick deposits of clay, sand, or artificial fill.

Seismic hazards can be assessed based on peak ground acceleration. During an earthquake, a particle attached to the earth will move back and forth irregularly. The horizontal force a structure must withstand during an earthquake is related to ground acceleration. Peak ground acceleration is the maximum acceleration experienced by a particle during an earthquake.

The United States Geological Survey (USGS) produces ground motion hazard maps at a given level of probability. Peak horizontal acceleration values are represented as a factor of “g.” The factor “g” is equal to the acceleration of a falling object due to gravity. These USGS Seismic Hazard Maps (USGS 2008) were reviewed for the Facility area with the results detailed below:

- There is a 2 percent probability of exceedance of an 8 to 10 percent “g” event in 50 years for the middle Hudson River Valley area; there is a higher risk in the Champlain Valley area for a 20 to 30 percent “g” event; and, in the lower Hudson/New York City area a 10-20 percent “g” event.
- There is a 10 percent probability of exceedance of a 2 to 3 percent “g” event in 50 years for the middle Hudson River Valley area; there is a higher risk in the Champlain Valley area of a 5 to 10 percent “g” event; and, in the lower Hudson/New York City area a 4 to 5 percent “g” event.

These percent “g” values are relatively higher in the Champlain Valley and New York City areas than most areas of the northeastern United States, but relatively lower than regions of the central (New Madrid) or western United States. As a result, the overall seismic hazard for the Facility is considered moderate.

3.2 Avoidance and/or Minimization of Potential Impacts

3.2.1 Geologic Resources

Along the underground route, initial clearing operations will include the removal of soils in the immediate trench area. Typically, the excavated trench will be four feet wide and four or five feet deep to allow for the proper depth and separation required for the burial of the cables.

Where impacts may occur, the EM&CP will specify the avoidance and/or minimization measures for disturbed soils along the route. Specifically, erosion controls such as hay bales and silt fencing will be used during construction to avoid and/or minimize stormwater run-on and run-off and erosion of soils and surficial geologic materials, both at the trench and at the soil stockpiles. Where soil compaction occurs, tractor and disc harrow (or similar) will be used to prepare the soil for restoration. Gullied, rilled, or rough sites will be smoothed and shaped to permit the use of equipment for plantings.

Since the underground portion of the route is located primarily along existing transportation rights-of-way and the surface soils will be re-established and seeded post-construction, loss of agricultural soils is not anticipated.

The underground route is located in geologic materials that can be easily worked with standard construction techniques. The installation of cable vaults will result in the excavation and offsite recycling of some of this surficial material. It is likely that much of the excavated material will be suitable for reuse as fill with local recyclers.

Bedrock that may be encountered during trenching will be removed using one of the following techniques:

- Conventional excavation with a backhoe,
- Hammering with a pointed backhoe attachment followed by backhoe excavation, or
- Blasting followed by backhoe excavation.

Blasting techniques are addressed in Section 1, Construction Methods.

Upon completion of the installation of the underground transmission cable, the surface of the right-of-way disturbed by construction activities will be graded to match the original topographic contours and to be compatible with surrounding drainage patterns, except at those locations where permanent changes in drainage will be required to prevent erosion that could lead to possible exposure of the cable.

HDD entry pits will be backfilled and the disturbed ground surface will be similarly graded. Segregated topsoil will be returned or replaced and soils that have been compacted by construction equipment traffic will be disked if necessary.

Cable right-of-way easements have the potential to result in certain restrictions on geologic resources, such as sand and gravel mines or silica mining from the Potsdam sandstone. However, no known mines were identified along the route. Underground portions of the route are proposed along existing transportation corridor routes, such as rail and roadway infrastructure property, thereby minimizing impacts to undeveloped geologic resources.

In summary, the potential impact to geologic resources from the installation and operation of the underground transmission cable is considered minor.

3.2.2 Seismic Hazard

Earthquakes and related seismic hazards are not anticipated to have an impact on the Facility. No known active faults with the potential for surface fault rupture were identified. Seismic related ground shaking during the lifetime of the Facility is probable.

To meet the known seismic conditions in the vicinity of the Facility, all facilities will be built to meet or exceed the seismic design provisions of the State of New York, as well as relevant local building codes.

4.0 VEGETATION AND NATURAL COMMUNITIES

This section provides a description of the upland vegetation cover types and significant natural communities that have the potential to occur along the underground cable Construction Zone, and the aquatic vegetation that may occur along underwater portions of the transmission cable. Measures to avoid and/or minimize potential impacts to upland and aquatic vegetation and any significant natural communities are also discussed. Descriptions of rare, threatened or endangered plant species under 6 NYCRR Part 193 (“RTE plants”) and measures to avoid and/or minimize impacts, if any, are described in Section 9.

The majority of the terrestrial portions of the Facility are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; (6) the Luyster Creek converter station area in Astoria; and (7) the approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation. From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority (“NYPA”). Included is a brief list of some of the common or typical plant species that may be found in each existing upland cover type. Vegetation community descriptions are based on the New York Natural Heritage Program’s *Draft Ecological Communities of New York State* (Edinger et al. 2002). Wetland vegetation cover types and communities are described in Section 5.

Aquatic vegetation occurs along portions of the New York shoreline of Lake Champlain, in the narrower southern end of the lake and down the length of the Hudson River. In the marine and estuarine portions of the route, macroalgae species occur in hard substrate areas where there is adequate salinity and water quality. The distribution of submerged aquatic vegetation is depth limited based on water clarity and the subsequent depth of the photic zone. In addition, two invasive species, Eurasian watermilfoil and water chestnut, have had a substantial negative effect on the distribution of native submerged aquatic vegetation (SAV) species.

4.1 Terrestrial Vegetation

Upland vegetation communities were identified on the basis of aerial photography, field observations, and available databases. The Applicants have conducted environmental field investigations, including ecological community mapping, along approximately 86.6 miles of CP and CSX railroad rights-of-way in Washington, Saratoga, Schenectady, and Albany counties. While the entire settlement route has not been field surveyed, the Applicants believe that there is sufficient information to broadly characterize the vegetative communities along the Facility construction zone.

4.1.1 Existing Vegetation

The upland vegetation cover types listed above can be categorized into three major groups, including: open uplands, forested uplands, and terrestrial cultural communities. Open uplands are defined as communities with less than 25 percent canopy cover of trees. Open upland communities include grasslands, meadows, and shrublands. Forested uplands are communities with greater than 60 percent canopy cover of trees. Forested upland communities occur on substrates with less than 50 percent rock outcrop or shallow soil over bedrock. Terrestrial cultural communities have been either created and maintained by human activities, or modified by human influence to such a degree that the physical conformation of the substrate or the biological composition of the resident community is substantially different from the character of the substrate or community that existed prior to human influence (Edinger et al. 2002). Table 4-1 presents the significant natural communities with the potential to occur along the underground transmission cable construction zone.

Open upland vegetative cover types that have been observed in the vicinity of the construction zone include successional old field and successional shrubland. Observed forested uplands include pitch pine-oak forest, Appalachian oak-pine forest, pine-northern hardwood forest, beech-maple mesic forest, hemlock-northern hardwoods forest, oak-tulip tree forest, successional northern hardwoods, and successional southern hardwoods. Observed terrestrial cultural communities include cropland/field crops, pine plantation, spruce/fir plantation, pastureland, mowed lawn, mowed roadside/pathway, unpaved and paved road/path, railroad, construction/road maintenance spoils, brushy cleared land, and urban vacant lot. Each of these 26 communities is described below.

For the portions of the Facility construction zone that have not yet been surveyed in the field, including the Route 22 right-of-way and additional portions of the CSX railroad right-of-way, available information suggests that the majority of these segments would include the 26 communities described below.

4.1.1.1 Successional Old Field

Successional old field is a meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned. Characteristic herbs within this community include goldenrods (*Solidago altissima, S. nemoralis, S. rugosa, S. juncea, S. canadensis,* and *Euthamia graminifolia*), bluegrasses (*Poa pratensis, P. compressa*), timothy (*Phleum pratense*), quackgrass (*Agropyron repens*), smooth brome (*Bromus inermis*), sweet vernal grass (*Anthoxanthum odoratum*), orchard grass (*Dactylis glomerata*), common chickweed (*Cerastium arvense*), common evening primrose (*Oenothera biennis*), oldfield cinquefoil (*Potentilla simplex*), calico aster (*Aster lateriflorus*), New England aster (*Aster novae-angliae*), wild strawberry (*Fragaria virginiana*), Queen-Anne's lace (*Caucus corota*), ragweed (*Ambrosia artemisiifolia*), hawkweeds (*Hieracium* spp.), dandelion (*Taraxacum officinale*), and ox-tongue (*Picris hieracioides*). Shrubs may be present, but collectively they have less than 50 percent cover in the community. Characteristic shrubs include gray dogwood (*Cornus foemina* ssp. *racemosa*), silky dogwood (*Cornus amomum*), arrowwood (*Viburnum recognitum*), raspberries (*Rubus* spp.), sumac (*Rhus typhina*, *R. glabra*), and eastern red cedar (*Juniperus virginiana*) (Edinger et al. 2002).

4.1.1.2 Successional Shrubland

Successional shrubland occurs on sites that have been cleared (for farming, logging, development, etc.) or otherwise disturbed. This community has at least 50 percent cover of shrubs. Characteristic shrubs within this community include gray dogwood (*Cornus foemina* ssp. *racemosa*), eastern red cedar (*Juniperus virginiana*), raspberries (*Rubus* spp.), hawthorne (*Crataegus* spp.), serviceberries (*Amelanchier* spp.), choke-cherry (*Prunus virginiana*), wild plum (*Prunus americana*), sumac (*Rhus glabra, R. typhina*), nanny-berry (*Viburnum lentago*), arrowwood (*Viburnum recognitum*), and multiflora rose (*Rosa multiflora*) (Edinger et al. 2002).

4.1.1.3 Pitch Pine-Oak Forest

Pitch pine-oak forest is a mixed forest that typically occurs on well-drained, sandy soils of glacial outwash plains or moraines. It also occurs on thin, rocky soils of ridgetops. The dominant trees are pitch pine (*Pinus rigida*) mixed with one or more of the following oaks: scarlet oak (*Quercus coccinea*), white oak (*Q. alba*), red oak (*Q. rubra*), or black oak (*Q. velutina*). The proportions of pines and oaks are variable within this community type. The shrublayer is well-developed with scattered clumps of scrub oak (*Quercus ilicifolia*) and a nearly continuous cover of low heath shrubs such as blueberries (*Vaccinium pallidum, V. angustifolium*) and black huckleberry (*Gaylussacia baccata*). The herbaceous layer is relatively sparse. Characteristic species are bracken fern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), and Pennsylvania sedge (*Carex pensylvanica*) (Edinger et al. 2002).

4.1.1.4 Appalachian Oak-Pine Forest

Appalachian oak-pine forest is a mixed forest that occurs on sandy soils, sandy ravines in pine barrens, or on slopes with rocky soils that are well-drained. The canopy is dominated by a mixture of oaks and pines. The oaks include one or more of the following: black oak (*Quercus velutina*), chestnut oak (*Q. montana*), red oak (*Q. rubra*), white oak (*Q. alba*), and scarlet oak (*Q. coccinea*). The pines are either white pine (*Pinus strobus*) or pitch pine (*P. rigida*); in some stands both pines are present. Red maple (*Acer rubrum*), hemlock (*Tsuga canadensis*), beech (*Fagus grandifolia*), and black cherry (*Prunus serotina*) are common associates occurring at low densities. The shrub layer is predominantly ericaceous, usually with blueberries (*Vaccinium* *angustifolium, V. pallidum*) and black huckleberry (*Gaylussacia baccata*). The ground layer is relatively sparse, and species diversity is low (Edinger et al. 2002).

4.1.1.5 Beech-Maple Mesic Forest

Beech-maple mesic forests is a broadly defined hardwood forest community type that occurs on moist, well-drained, usually acid soils. The dominant trees are sugar maple (*Acer saccharum*) and beech (*Fagus grandifolia*). Common associates are yellow birch (*Betula alleghaniensis*), white ash (*Fraxinus americana*), eastern hop hornbeam (*Ostrya virginiana*), and red maple (*Acer rubrum*). Characteristic small trees or tall shrubs are hobblebush (*Viburnum lantanoides*), American hornbeam (*Carpinus caroliniana*), striped maple (*Acer pensylvanicum*), witch hazel (*Hamamelis virginiana*), and alternate-leaved dogwood (*Cornus alternifolia*). Dominant groundlayer species are star flower (*Trientalis borealis*), common wood-sorrel (*Oxalis montana*), Canada mayflower (*Maianthemum canadense*), painted trillium (*Trillium undulatum*), purple trillium (*T. erectum*), shining clubmoss (*Lycopodium lucidulum*) and intermediate wood fern (*Dryopteris intermedia*). Associated herbs include Christmas fern (*Polystichum acrostichoides*), jack-in-the-pulpit (*Arisaema triphyllum*) and false Solomon's seal (*Smilacina racemosa*). There are many spring ephemerals which bloom before the canopy trees leaf out. Typically there is also an abundance of tree seedlings, especially of sugar maple; beech and sugar maple saplings are often the most abundant “shrubs” and small trees. Hemlock (*Tsuga canadensis*) may be present at a low density. In the Adirondacks a few red spruce (*Picea rubens)* may also be present (Edinger et al. 2002).

4.1.1.6 Hemlock-Northern Hardwoods Forest

Hemlock-northern hardwoods forest is a mixed forest that typically occurs on middle to lower slopes of ravines, on cool, mid-elevation slopes, and on moist, well-drained sites at the margins of swamps. In any one stand, hemlock (*Tsuga canadensis*) is codominant with any one to three of the following: beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), red maple (*A. rubrum*), black cherry (*Prunus serotina*), white pine (*Pinus strobus*), yellow birch (*Betula alleghaniensis*), black birch (*B. lenta*), red oak (*Quercus rubra*), and basswood (*Tilia americana*). The relative cover of hemlock is quite variable, ranging from nearly pure stands in some steep ravines to as little as 20% of the canopy cover. Striped maple (*Acer pensylvanicum*) is often prominent as a mid-story tree. The shrublayer may be sparse; characteristic shrubs are hobblebush (*Viburnum lantanoides*), mapleleaf viburnum (*Viburnum acerifolium*), and raspberries (*Rubus* spp.). In some ravines, especially in the southern part of the state, rosebay (Rhododendron maximum) forms a dense subcanopy or tall shrublayer. Canopy cover can be quite dense, resulting in low light intensities on the forest floor and hence a relatively sparse groundlayer. Characteristic groundlayer plants are Indian cucumber-root (*Medeola virginiana*), Canada mayflower (*Maianthemum canadense*), shining clubmoss (*Lycopodium lucidulum*), common wood fern (*Dryopteris intermedia*), mountain wood fern (*Dryopteris campyloptera*), Christmas fern (*Polystichum acrostichoides*), star flower (*Trientalis borealis*), bellwort (*Uvularia sessilifolia*), common wood-sorrel (*Oxalis acetosella*), partridge berry (*Mitchella repens*), foamflower (*Tiarella cordifolia*), round-leaf violet (*Viola rotundifolia*), twisted stalk (*Streptopus roseus*), purple trillium (*Trillium erectum*), and the moss *Leucobryum glaucum*. In forests that have beech as a codominant, beech-drops (*Epifagus virginiana*) is a common herb (Edinger et al. 2002).

4.1.1.7 Oak-Tulip Tree Forest

Oak-tulip tree forests are mesophytic hardwood forests that occur on moist, well-drained sites in southeastern New York. The dominant trees include a mixture of five or more of the following: red oak (*Quercus rubra*), tulip tree (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), black birch (*Betula lenta*), red maple (*Acer rubrum*), scarlet oak (*Quercus coccinea*), black oak (*Q. velutina*), and white oak (*Q. alba*). There is typically a subcanopy stratum of small trees and tall shrubs dominated by flowering dogwood (*Cornus florida*); common associates include witchhazel (*Hamamelis virginiana*), sassafras (*Sassafras albidum*), red maple, and black cherry (*Prunus serotina*). Common low shrubs include maple-leaf viburnum (*Viburnum acerifolium*), northern blackberry (*Rubus allegheniensis*), and blueberries (*Vaccinium angustifolium, V. pallidum*). The shrublayer and groundlayer flora may be diverse. Characteristic groundlayer herbs are white wood aster (*Aster divaricatus*), New York fern (*Thelypteris noveboracensis*), Virginia creeper (*Parthenocissus quinquefolia*), jack-in-the-pulpit (*Arisaema triphyllum*), wild geranium (*Geranium maculatum*), Solomon's-seal (*Polygonatum biflorum*), and false Solomon's-seal (*Smilacina racemosa*) (Edinger et al. 2002).

4.1.1.8 Pine-Northern Hardwood Forest

Pine-northern hardwood forest is a mixed forest that occurs on gravelly outwash plains, delta sands, eskers, and dry lake sands in the Adirondacks. The dominant trees are white pine (*Pinus strobus*) and red pine (*P. resinosa*). These are mixed with scattered paper birch (*Betula papyrifera*) and quaking aspen (*Populus tremuloides*). In some stands there is a mixture of other northern hardwoods and conifers such as yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), and red spruce (*Picea rubens*). Characteristic shrubs are blueberries (*Vaccinium angustifolium, V. myrtilloides*), sheep laurel (*Kalmia angustifolia*), wild raisin (*Viburnum cassinoides*), and shadbush (*Amelanchier canadensis*). Characteristic herbs are bracken fern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), trailing arbutus (*Epigaea repens*), cow-wheat (*Melampyrum lineare*), Canada mayflower (*Maianthemum canadense*), bunchberry (*Cornus canadensis*), star flower (*Trientalis borealis*), bluebeads (*Clintonia borealis*), painted trillium (*Trillium undulatum*), spreading ricegrass (*Oryzopsis asperifolia*), and Pennsylvania sedge (*Carex pensylvanica*). Mosses and lichens may be common to abundant, especially the mosses *Pleurozium schreberi*, *Brachythecium* spp., and *Dicranum polysetum* (Edinger et al. 2002).

4.1.1.9 Successional Northern Hardwoods

Successional northern hardwoods are a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees and shrubs include any of the following: quaking aspen (*Populus tremuloides*), bigtooth aspen (*P. grandidentata*), balsam poplar (*P. balsamifera*), paper birch (*Betula papyrifera*), or gray birch (*B. populifolia*), pin cherry (*Prunus pensylvanica*), black cherry (*P. serotina*), red maple (*Acer rubrum*), white pine (*Pinus strobus*), with lesser amounts of white ash (*Fraxinus americana*), green ash (*F.*

pensylvanica), and American elm (*Ulmus americana*). Northern indicators include aspens, birches, and pin cherry (Edinger et al. 2002).

4.1.1.10 Successional Southern Hardwoods

Successional southern hardwoods are a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees and shrubs include any of the following: American elm (*Ulmus americana*), slippery elm (*U. rubra*), white ash (*Fraxinus americana*), red maple (*Acer rubrum*), box elder (*Acer negundo*), silver maple (*A. saccharinum*), sassafras (*Sassafras albidum*), gray birch (*Betula populifolia*), hawthorns (*Crataegus* spp.), eastern red cedar (*Juniperus virginiana*), and choke-cherry (*Prunus virginiana*). Certain introduced species are commonly found in successional forests, including black locust (*Robinia pseudo-acacia*), tree-of-heaven (*Ailanthus altissima*), and buckthorn (*Rhamnus cathartica*). Any of these may be dominant or co-dominant in a successional southern hardwood forest. Southern indicators include American elm, white ash, red maple, box elder, choke-cherry, and sassafras (Edinger et al. 2002).

4.1.1.11 Cropland/Field Crops

Cropland/field crops are agricultural fields planted in field crops such as alfalfa, wheat, timothy, and oats. This community includes hayfields that are rotated to pasture (Edinger et al. 2002).

4.1.1.12 Pastureland

Pastureland is agricultural land permanently maintained (or recently abandoned) as a pasture area for livestock (Edinger et al. 2002).

4.1.1.13 Pine Plantation

Pine plantation is a stand of pines planted for the cultivation and harvest of timber products, or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping. Pine plantations may be monocultures with more than 90 percent of the canopy cover consisting of one species, or they may be mixed stands with two or more co-dominant species (in which case more than 50 percent of the cover consists of one or more species of pine). Pines typically planted in New York include white pine (*Pinus strobus*), red pine (*P. resinosa*), Scotch pine (*P. sylvestris*), pitch pine (*P. rigida*), and jack pine (*P. banksiana*). Ground layer vegetation is usually sparse because of the dense accumulation of leaf litter. Speedwell (*Veronica officinalis*) is a characteristic ground layer plant (Edinger et al. 2002).

4.1.1.14 Spruce/Fir Plantation

Spruce/fir plantation is a stand of softwoods planted for the cultivation and harvest of timber products, or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping. Spruce/fir plantations may be monocultures with more than 90 percent of the canopy cover consisting of one species, or they may be mixed stands with two or more co-dominant species (in which case more than 50 percent of the cover consists of one or more species of spruce or fir). Softwoods typically planted in New York include Norway spruce (*Picea abies*), white spruce (*P.*

glauca), balsam fir (*Abies balsamea*), and Douglas fir (*Pseudotsuga menziesii*). Ground layer vegetation is usually sparse because of the dense accumulation of leaf litter. Speedwell (*Veronica officinalis*) is a characteristic ground layer plant (Edinger et al. 2002).

4.1.1.15 Mowed Lawn with Trees

Mowed lawn with trees is residential, recreational, or commercial land in which the groundcover is dominated by clipped grasses and forbs. It is shaded by at least 30 percent cover of trees. Ornamental and/or native shrubs may be present, usually with less than 50 percent cover. The groundcover is maintained by mowing (Edinger et al. 2002).

4.1.1.16 Mowed Lawn

Mowed lawn is residential, recreational, or commercial land, or unpaved airport runways in which the groundcover is dominated by clipped grasses and there is less than 30 percent cover of trees. Ornamental and/or native shrubs may be present, usually with less than 50 percent cover. The groundcover is maintained by mowing (Edinger et al. 2002).

4.1.1.17 Mowed Roadside/Pathway

Mowed roadside/pathway is a narrow strip of mowed vegetation along the side of a road, or a mowed pathway through taller vegetation (e.g., meadows, old fields, woodlands, forests), or along utility rights-of-way (e.g., power lines, telephone lines, gas pipelines). The vegetation in these mowed strips and paths may be dominated by grasses, sedges, and rushes; or it may be dominated by forbs, vines, and low shrubs that can tolerate infrequent mowing (Edinger et al. 2002).

4.1.1.18 Herbicide-Sprayed Roadside/Pathway

Herbicide-sprayed roadside/pathway is a narrow strip of low-growing vegetation along the side of a road, or along utility rights-of-way (e.g., power lines, telephone lines, gas pipelines) that is maintained by spraying herbicides (Edinger et al. 2002).

4.1.1.19 Unpaved Road/Path

Unpaved road/path is a sparsely vegetated road or pathway of gravel, bare soil, or bedrock outcrop. These roads or pathways are maintained by regular trampling or scraping of the land surface. The substrate consists of the soil or parent material at the site, which may be modified by the addition of local organic material (woodchips, logs, etc.), or sand and gravel. A characteristic plant of this community is path rush (*Juncus tenuis*) (Edinger et al. 2002).

4.1.1.20 Railroad

Railroad is a permanent road having a line of steel rails fixed to wood ties and laid on a gravel roadbed that provides a track for cars or equipment drawn by locomotives or propelled by self-contained motors. There may be sparse vegetation rooted in the gravel substrate. The railroad right-of-way may be maintained by mowing or herbicide spraying (Edinger et al. 2002).

4.1.1.21 Paved Road/Path

Paved road/path is a road or pathway that is paved with asphalt, concrete, brick, or stone. There may be sparse vegetation rooted in cracks in the paved surface (Edinger et al. 2002).

4.1.1.22 Construction/Road Maintenance Spoils

Construction/road maintenance spoils occur on a site where soils from construction work and/or road maintenance materials have been recently deposited. There is little, if any, vegetation (Edinger et al. 2002).

4.1.1.23 Brushy Cleared Land

Brushy cleared land is land that has been clearcut or cleared by brush-hog. There may be a lot of woody debris such as branches and slashings from trees that were logged. Vegetation is patchy, with scattered herbs, shrubs, and tree saplings. The amount of vegetative cover depends on soil fertility and the length of time since the land was cleared (Edinger et al. 2002).

4.1.1.24 Rock Quarry

Rock Quarries are excavations in bedrock from which building stone (e.g., limestone, sandstone, slate) have been removed. Vegetation may be sparse; plants may be rooted in crevices in the rock surface (Edinger et al. 2002).

4.1.1.25 Junkyard

Junkyard is a site that has been cleared for disposal or storage of primarily inorganic refuse, including discarded automobiles, large appliances, mechanical parts, etc (Edinger et al. 2002).

4.1.1.26 Urban Vacant Lot

Urban vacant lot is an open site in a developed, urban area that has been cleared either for construction or following the demolition of a building. Vegetation may be sparse, with large areas of exposed soil, and often with rubble or other debris. Characteristic trees are often naturalized exotic species such as Norway maple (*Acer platanoides*), white mulberry (*Morus alba*), and tree-of-heaven (*Ailanthus altissima*), a species native to northern China and introduced as an ornamental. Tree-of-heaven is fast growing and tolerant of the harsh urban environment; it can dominate a vacant lot and form dense stands (Edinger et al. 2002).

4.1.2 Significant Natural Communities or Protected Plant Communities

The potential presence of significant natural communities and/or RTE plants was initially determined through a review of available publications, aerial photography and databases maintained by the NYSDEC (NYSDEC 2009a) and United States Fish and Wildlife Service (USFWS) (USFWS 2009). The Applicants conducted a preliminary review of the agency database information by searching for RTE plants and significant natural community occurrences along the route. The Applicants have also mapped ecological communities observed in the field along the CP and portions of the CSX railroad rights-of-way, which can be found in the Application, Appendix C (Joint Proposal Exhibit 17), and the Supplement, Attachment B (Joint Proposal Exhibit 28).

Significant natural communities are defined by the NYNHP as either rare natural communities, or the best examples of more common natural communities. The Facility is located within the vicinity of NYNHP-mapped significant deep emergent marsh and floodplain forest communities. Deep emergent marsh is ranked as S5, indicating this community is secure, or relatively common, in New York State. Floodplain forest has the NYNHP rank S2, indicating it is a rare community in the state. At the southern end of the Haverstraw Bay Bypass route in the vicinity of Hook Mountain State Park is the NYNHP-mapped oak-tulip tree forest. The community is described as a mature sugar maple and red oak dominated forest of moderate size with several exotics species, but also with several nice, large tree patches within a roughly 1,600 acre natural area (not including the adjacent river) along the west bank of the lower Hudson River. The community is positioned along streams and on steep south-facing to northeast-facing slopes on the west bank of the Hudson River. This community is described in Section 4.1.1.7 above; further information on wetland communities in the vicinity of the Facility is provided in Section 5.

The Applicants have initiated consultation with the NYSDEC, NYNHP, and USFWS regarding the potential for RTE plants and/or significant natural communities to occur in the vicinity of the Facility. It is expected that further consultation with these agencies will provide more specific information on species occurrences and communities in the immediate vicinity of the Facility, which will allow the Applicants to further refine the list of plant communities with potential presence in the vicinity of the Facility

RTE plants that have the potential to occur in the vicinity of the Facility are discussed in Section 9.2.3.

4.1.3 Avoidance and/or Minimization of Potential Impacts

Vegetation clearing and excavation activities within the construction zone will result primarily in temporary impacts to vegetative communities along the proposed transmission cable construction zone. Impacts are anticipated to be insignificant given that most equipment staging and access will be from the access road adjacent to the track. Further details on underground construction methods are provided in Section 1.1.1.

The Luyster Creek converter station is located in a largely urban environment. The impacts to upland vegetation from construction and operation of the aboveground facilities are expected to be clearing of trees at the edge of a small cluster of trees.

Most of the vegetation that will be impacted along the underground portions of the construction zone consists of previously disturbed herbaceous and/or shrubby cover within the existing railroad or roadway rights-of-way. Previous vegetation management along the railroad rights-of-way and associated utility lines along the railroads as well as Route 22 have resulted in primarily early successional vegetation. Herbaceous vegetation and successional shrubs within the areas impacted by construction are expected to recover quickly following restoration and stabilization of the construction zone. Permanent changes to vegetation cover are not anticipated except in a select few areas where forested cover may be converted to a shrub community as part of the Applicants' Vegetation Management Plan. During operation of the Facility, activities associated with this plan will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the transmission cables and/or selective cutting to prevent the establishment of large trees directly over the cables. The Applicants will develop a Vegetation Management Plan as part of the EM&CP. Any vegetation management activities currently conducted by the railroads within the right-of-way will continue following the construction and operation of the underground transmission cable.

The Facility has been designed to avoid and/or minimize impacts to forested communities by routing the underground portions of the Facility along existing railroad and roadway rights-of-way. This alignment places the Facility mostly along the forest edge in areas where forested communities occur, which reduces the amount of potential impact to the canopy vegetation and avoids and/or minimizes additional fragmentation of forested habitats. Where forested areas cannot be avoided, some larger trees may be cleared in the outer portion of the construction zone, away from the railroad bed. This may result in some impact to forest vegetation, as mature woody vegetation will take a longer time to become re-established than herbaceous vegetation and successional shrubs. In total, approximately 236 acres of existing forest cover may be removed to accommodate proposed construction areas and easements. Forested areas existing within the construction zone will go through a series of successional stages before a mature canopy is developed. To avoid and/or minimize impacts to forested communities, The Applicants will avoid cutting mature trees where feasible. The Applicants will also limit the removal of stumps and roots that are not in the footprint of the excavated trench, except where removal is required for safe construction, to allow resprouting and assist in the recovery of woody species.

Weather permitting, the re-establishment of vegetation within the construction zone will begin as soon as possible following construction and any final surface grading in the construction zone. Initial revegetation will be conducted by seeding with annual rye grass, or other suitable cover, which will assist in stabilizing soils and rapidly establishing vegetation to prevent colonization with any invasive exotic plant species.

Temporary erosion and sediment control devices will be installed prior to ground disturbance, where needed, and will be maintained through construction until vegetation cover is established or any permanent erosion controls are installed. Revegetation success within disturbed areas could also be affected if heavy vehicles and equipment cause soil compaction, affecting plant growth and water permeability. Soil compaction is not expected to be an important factor along the underground portions of the route, because most vehicles and equipment will either be mounted on the track, or operating from existing access roads or fill associated with the railroad embankment. If initial seeding is unsuccessful, any disturbed areas will be re-seeded, if required, until sufficient vegetation cover is established.

Following backfilling, final grading, and erosion control seeding of the construction zone, disturbed areas will generally be allowed to revegetate naturally. As noted above, permanent changes to vegetation cover are not anticipated except in a select few areas where forested cover may be converted to a shrub community as part of the Applicants' Vegetation Management Plan, which will be developed as part of the EM&CP. In total, approximately 60 acres of existing forest cover may be permanently removed.

The Facility is located in or near NYNHP-mapped significant deep emergent marsh and floodplain forest communities. Impact avoidance, minimization and mitigation for these and other wetland communities is described in Section 5. The Applicants will continue to consult with the NYSDEC, NYNHP, and USFWS regarding the potential for significant natural communities to occur in the vicinity of the Facility. Additional information will be provided in the EM&CP.

4.2 Aquatic Vegetation

4.2.1 Existing Submerged Aquatic Vegetation and Macroalgae

4.2.1.1 Lake Champlain

Historically there have been numerous species of aquatic vegetation present in Lake Champlain along shoreline areas and in shallow embayments. Native milfoils, pondweeds (*Potamogeton* spp.) *Nymphoides peltatum*, and water celery (*Vallisneria americana*) are commonly found SAV species. In recent decades, the two invasive species, water chestnut (*Trapa natans*) and Eurasian watermilfoil (*Myriophyllum spicatum*) have become dominant, particularly at the southern end of the lake (World Lake Database 2010). The water celery is a native perennial submerged macroyphyte species with a summertime active growth period and a rapid growth rate. The blooming period also occurs during the summer, and while seed and vegetative spread rate is moderate. Water celery has been adapted to grow in fine-, medium-, and coarse-textured soils, and the minimum temperature tolerance is -33°F (USDA 2010). For the majority of the cable route in the lake, water depths exceed those that support SAV; it is only in the narrow southern end of the lake that the cables are likely to occur in proximity to SAV and the cables now exit the water at Route Mile 103 rather than at Route Mile 111 as proposed in the Application.

Eurasian watermilfoil and water chestnut, two non indigenous plant species, are known to crowd out native species and impede recreational activities, such as fishing, boating and swimming, by forming dense monotypic stands (LCBP 2005). These two species are presently in Lake Champlain and are two of the 13 priority aquatic nuisance species listed for the Lake Champlain Basin. Eurasian watermilfoil and water chestnut can cause significant negative ecological and economic impacts and have a high potential of expanding their ranges throughout the Lake Champlain Basin, causing even greater impacts. Management activities, including education and outreach efforts, are ongoing for each of these species (LCBP 2005).

<u>Water Chestnut</u>

Water chestnut, an annual aquatic plant native of Europe, Asia, and Africa, was first documented in Lake Champlain in the early 1940s in shallow bays in the southern end on both the Vermont and New York shores. It is generally assumed that water chestnut seeds hitchhiked to Lake

Champlain on boats traveling through the Champlain Canal from the Mohawk or Hudson River, where it had been previously established. Water chestnut displaces other aquatic plant species, is of little food value to wildlife, and forms dense mats that alter habitat and interfere with recreational activities. Currently, extensive growth of water chestnut in southern Lake Champlain severely restricts boat traffic and other recreational uses. Populations of water chestnut also exist in several inland lakes in the southern portion of Vermont (LCBP 2005). Figure 4-1 shows the status of water chestnut infestation in Lake Champlain.

Eurasian Watermilfoil

The Eurasian watermilfoil is a perennial, submerged aquatic plant native to Europe, Asia, and parts of Africa. It was first discovered in New England in 1962 when it was reported in St. Albans Bay of Lake Champlain. This invasive plant is now widely distributed throughout North America. The aquarium trade likely played a role in its initial introduction and spread. A 1976 survey of Lake Champlain showed Eurasian watermilfoil present in all areas of the lake, and estimated that several thousand acres of the lake were infested. Eurasian watermilfoil continues to occupy an extensive range throughout the lake. New infestations of Eurasian watermilfoil are discovered nearly every year. Fragments attached to trailered boats are the likely cause of these overland introductions. Eurasian watermilfoil can proliferate in high densities in lakes causing impairments to water recreation such as boating, fishing and swimming and a reduction in native species (LCBP 2005).

4.2.1.2 Hudson River Estuary

There are two predominant species of rooted aquatic plants in the Hudson River Estuary, the native submerged water celery and the exotic floating-leafed water chestnut. Plant coverage averaged over the entire upper and lower tidal freshwater and brackish study area is about 6 percent of the river bottom for water celery and 2 percent for water chestnut, although the distribution of both plants varies greatly among the reaches of the tidal freshwater Hudson River (Findlay et al. 2006). Beds of both species vary in size from 30 square meters (m^2) to a maximum of about 100 ha (1 million m^2). Bed size distributions for water celery are strongly log-normal with far more small beds than large. Due to light limitations, plants are generally found in water shallower than 3 meters, although beds can be deeper in the most upriver sections (Findlay et al. 2006). Other submerged aquatic plants found in the Hudson River include the native clasping leaved pondweed (*Potamogeton perfoliatus*) and slender naiad (*Najas flexilis*) and the non-native curly pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (Findlay et al. 2006; New York Sea Grant 2010). Figure 4-2 depicts the aquatic vegetation beds identified from the upper to lower Hudson River.

Upper Freshwater Zone

This zone is defined as river mile 155 to 129, from Troy Dam to New Baltimore. The settlement route does not include this section of the Hudson River.

Lower Freshwater Zone

This zone is defined as river mile 129 to 60, from New Baltimore to Newburgh. This zone is largely freshwater although the most downriver portion can be slightly brackish during periods of low river discharge in dry years. This zone includes four geomorphic sections of the Hudson River estuary: bifurcating channel-shoal, meander segment, narrow river, and wide river. The uppermost lower freshwater section is bifurcating channel-shoal, and extends to around Kingston. This part of the Hudson River has many shallow areas and islands in the channel and numerous tributaries with deltaic deposits. Maximum depths are as much as 15 to 17 meters, and the channel ranges from 0.3 to 1.0 kilometers (km) wide. The flats, numerous backwaters, stream mouths, and side channels of this uppermost section support a wide variety of SAV beds (Findlay et al. 2006).

From Kingston to Staatsburg, the river meanders with broad flats associated with bends. The channel is typically 0.6 to 1.0 km wide with maximum depths of 22 to 31 meters. Several tributaries have created shallow sediment deposits, including a large sediment flat downstream of the mouth of Rondout Creek. Several of the largest SAV beds in the Hudson River are in this reach (Findlay et al. 2006). From Staatsburg to Wappingers Creek the Hudson River is narrow; there are few broad flats and shallows for large SAV beds, and only two study sites were in this section. The river is commonly 0.8 to 1.2 km wide with maximum depths from 29 to 42 meters (Findlay et al. 2006). From Wappingers Creek to slightly below Newburgh, the river is often called Newburgh Bay because of its large width (1.0 to 1.4 km) and shallower depth (maximum 15 to 18 meters). Slightly brackish water reaches into this section during dry years. Turbidity is relatively high, and only one SAV study site was located in the area (Findlay et al. 2006).

Brackish Zone

This zone is defined as river mile 60 to 33 or Newburgh to Hastings. The Hudson River in this zone is consistently brackish during summer flow conditions, with salinity levels varying in response to tides and river discharge. This zone is in two different morphological segments: Hudson Highlands and wide estuary. From below Newburgh to Peekskill, the river is narrow (0.5 to 0.8 km), deep (maximum 28 to 48 meters), turbulent, and mostly a steep-sided rock channel with minimal shallows. Large rock formations in the channel and broad bends create shallow backwaters supporting SAV (Findlay et al. 2006). Below Peekskill the river emerges into a broad (1.0 to 1.5 km) and shallow (maximum depth about 13 meters) estuary section, Haverstraw Bay. Large flats extend from shore to the navigation channel, and shoreline features provide protected shallow waters. Despite the shallow water, SAV beds are not common in this reach of the Hudson, perhaps because of the generally high turbidity (Findlay et al. 2006).

Further downstream from Hastings, the salinity gradually increases until reaching marine conditions where SAV is composed of seagrasses which can survive the higher salinities, or macroalgae. Potential species include sea lettuce (*Ulva* spp.), knotted wrack (*Ascophyllum nodosum*), rockweed (*Fucus vesiculosus*), oarweed (*Laminaria digitata*), and Irish moss (*Chondurs crispus*).

Ulva is primarily found in marine environments, but can also be found in brackish water, particularly estuaries. They are usually seen in dense groups, attached to rocks in the middle to low intertidal zone and as deep as 10 meters in calm, protected harbors (Monterey Bay Aquarium Research Institute [MBARI] 2010). Knotted wrack is an intertidal algae conspicuous due to its ability to float with the changing water surface. The plants are held to the substratum by discoid holdfasts which in dense populations frequently coalesce. Reproduction is sexually, through the union of eggs and sperms produced in the conceptacular cavities of ripe receptacles. Receptacles are initiated in April to June, and gamete release also occurs during that time period. Knotted wrack is primarily a mid to low intertidal species. The upper limits of distribution are controlled by its ability to resist desiccation and high temperatures. Where present, this species dominates the mid-intertidal zone (Doty et al. 1987). Rockweed is a large brown algae found intertidally on the middle-shore zone. This species is attached to rocky substrates by means of a discoid holdfast in a wide range of exposures. It is often associated with knotted wrack (Marine Life Information Network 2010).

Oarweed is normally restricted to subtidal habitats. This is a large plant, often reaching the water surface at low water, but the holdfast remains underwater at all times. Exceptions occur at very exposed sites where scattered small individuals may be found in the lower intertidal zone and may also be found in intertidal pools on exposed coasts. Horizontal distribution of oarweed is determined to a large extent by substratum type and salinity. In very sheltered sites the species can occur on an unstable substratum of gravel and small stones, but it is absent from muddy and sandy bottoms. In exposed sites, oarweed is restricted to hard rock substrata. This specie is absent from sites with salinities of less than approximately 20 parts per thousand (Doty et al. 1987). Irish moss extends from the littoral fringe to 20 meter below mean low water (MLW), depending on wave action, transparency, and other topographic conditions. Where present, this species is usually most abundant near MLW to the mid-subtidal zone, with varying densities and morphologies occurring throughout this gradient. Irish moss grows from a discoid holdfast on massive and stable outcrops (ledges), with substantially reduced populations on smaller rocks and sand/or sediment-covered rocks. This species grows most abundantly on semi-exposed coastal sites and is common in estuarine habitats, particularly where strong tidal currents occur (Doty et al. 1987).

4.2.2 Avoidance and/or Minimization of Potential Impacts

Aquatic plants in a lake or pond grow in an area known as the littoral zone, the shallow transition zone between dry land and the open water area of the lake. In the main body of the lake, the proposed construction activities in Lake Champlain will be within the deeper portions of the lake and generally a considerable distance from the shoreline; hence potential impacts to aquatic macrophytes in the northwest arm and main sections of Lake Champlain are expected to be insignificant.

The southern section of Lake Champlain is both narrow and shallow, thus limiting the amount of open water workspace for construction activities. The re-suspended sediment and turbidity from construction activities could potentially affect aquatic vegetation through reduced photosynthesis by covering the leaf surface with fine silts or clay or reducing light penetration through the water column. The increase in turbidity and re-suspended sediments will be short-term and localized, and will be similar to periodic storm events and anthropogenic activities (e.g., boating, swimming, invasive plant removal) that occur within the lake. The reduction of the aquatic portion of the route within Lake Champlain from the route proposed in the Application, combined with the assumption of the use of shear plow technology, will further ensure that the increase in turbidity and resuspended sedimentation in southern Lake Champlain will be short-term and localized.

Impacts from water jetting, trench excavation and/or disturbance to the bottom from vessel anchors could affect the invasive Eurasian watermilfoil and the water chestnut that currently dominate the southern lake sections of Lake Champlain. Currently there are BMPs implemented (i.e., mechanical and hand harvest, biological and drawdown controls) to control the spread of these invasive aquatic nuisance plant species, particularly the dense water chestnut mats in the southern lake sections of Lake Champlain where it has restricted boat traffic. Consultations with state agencies will be conducted prior to development of the EM&CP and BMPs will be implemented to avoid and/or minimize impacts to native species SAV beds. BMPs will also be employed to avoid and/or minimize the potential to cause further spread of invasive aquatic plant species.

Non-burial installation may be used where surficial geology, foreign pipeline or cable crossings, unavoidable bedrock areas, and/or potential contaminated sediments do not permit cable burial (see Section 1). Non-burial installation will require the use of a protective covering, such as rip-rap or articulated concrete mats. If any impacts to SAV are associated with non-burial installation, these areas will be identified and addressed in the EM&CP.

At landfall locations, HDD will be used for cable installation to avoid shallow water as the cable enters the river, avoiding and/or minimizing disturbance of any SAV beds that may be present. Construction activities will cause a slight increase in turbidity. However, the expected increase in turbidity from construction activities will be similar to periodic storm events and anthropogenic activities (e.g., boating, swimming, invasive plant removal) that occur within the Hudson River. Consultations with state agencies will be conducted prior to development of the EM&CP, and BMPs will be implemented to avoid and/or minimize impacts to SAV beds, as well as minimizing the amount of turbidity from construction activities.

During cable installation using HDD methods, there is the chance of an inadvertent release of drilling fluid from the drill hole upwards through the sediment overburden with a release at the sediment water interface. In this event, the gelatinous drilling fluid will flow outward from the point of discharge and cover the bottom. Depending on currents or wave action, some of the deposited drilling fluid can become suspended or more dispersed. Drilling fluid is composed primarily of bentonite clay and water, if suspended, it may have similar adverse effects on SAV photosynthesis as described above for suspended sediments.

During the installation and construction of the cables, a number of vessels, including tugs, barges, cranes, and workboats will be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials; thus, the potential exists for an oil spill. BMPs and an SPCC Plan will be employed throughout construction and will be implemented in the case of a spill to limit the impacts from oil and fluid spills. The waters of the proposed cable route are also frequented by various vessels on a daily basis; therefore, the introduction of vessels to the area during the construction period will not significantly change the probability for an oil or fluid spill compared to the existing conditions.

During Facility operation, the only potential impact to SAV will occur in the event of cable damage. In this instance, the cable will be excavated on either side of the repair location and cut, a replacement cable will be spliced in, and the cable will be reburied (see Section 1.2.1). The Applicants will develop protocols for maintenance and emergency repair activities consistent with the requirements of their Certificate. The impacts to any SAV in the vicinity will be similar to those described for the original installation, but much smaller in duration and extent. Because the cable does not contain a coolant fluid like certain other electric cables, there is no potential for fluid release in the event of a damaged cable.

5.0 WETLANDS AND WATER RESOURCES

This section provides a description of the surface and groundwater resources in the vicinity of the Facility. An overview of existing surface water resources, major watersheds, and state and federal regulations pertaining to surface waters along the entire route is provided in Section 5.1. This section also includes an analysis of the existing freshwater resources, estuarine wetlands, and associated water quality along the underground portions of the route, including potential impacts and proposed mitigation methods.

The Facility includes a 1,000 MW High Voltage Direct Current (“HVDC”) transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within Lake Champlain, the Hudson River, Harlem River and the East River. The majority of the terrestrial portions of the Facility are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River, (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; (6) the Luyster Creek converter station area in Astoria, in the borough of Queens, New York City; and (7) the approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation. From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority (“NYPA”).

A more detailed discussion of existing water quality and potential impacts for the underwater portions of the Facility within Lake Champlain, the Hudson River, Harlem River, and East River is provided in Section 6 of this application. Existing groundwater resources for the entire route are described in Section 5.3, along with potential impacts and proposed avoidance and/or minimization measures.

5.1 Surface Waters and Freshwater Wetlands

Surface waters in the vicinity of the Facility include freshwater streams, rivers, lakes and ponds, freshwater tidal and brackish estuarine waters, and wetlands. Further information on the major surface waters traversed by the underwater portions of the Project corridor, including Lake Champlain, the lower Hudson River, Harlem River, and East River is provided in Sections 6 and 7.

The Clean Water Act (CWA) regulates activities within jurisdictional waters of the United States, which include navigable waterways and their tributaries, bordering wetlands, and any other bordering or isolated waters with a significant nexus to other waterways, such that the use, degradation, or destruction of those waters could affect interstate or foreign commerce. The USACE administers permitting and compliance under Section 404 of the CWA, which regulates discharge of dredged or fill material into waters of the United States. Construction of a transmission cable within navigable waterways, such as the Hudson River and Lake Champlain, additionally requires authorization from the USACE under Section 10 of the Rivers and Harbors Act of 1899. In accordance with Section 401 of the CWA, the Applicants under Article VII of the New York Public Service Law involving activities in jurisdictional Waters of the United States also must obtain a Water Quality Certificate (WQC) from the NYSPSC, indicating that the proposed activity will not violate water quality standards. Information on waterways and wetlands under federal jurisdiction is provided in Sections 5.1.1 and 5.1.3, respectively.

Freshwater wetlands in New York State are regulated under the Freshwater Wetlands Act (FWA), Article 24 of the Environmental Conservation Law and 6 New York Code of Rules and Regulations Part 663 (6 NYCRR Part 663). State jurisdictional wetlands in general must be at least 12.4 acres; however, New York State also has jurisdiction over smaller wetlands if they are deemed to have unusual local importance. In accordance with the FWA, the NYSDEC also regulates activities within the 100-foot Adjacent Area outside of the wetland boundary. Further information on existing state-regulated freshwater wetland areas is provided in Section 5.1.3.

The presence of wetlands and waterbodies in the vicinity of the Facility was initially determined through a review of available USGS 7.5-minute topographic mapping, NYSDEC wetlands mapping, National Wetlands Inventory (NWI) mapping, and/or aerial photography. The Applicants retained HDR|DTA Engineering, Inc. (HDR|DTA) and TRC Environmental Corporation (TRC) to conduct environmental field investigations, including the identification of waterbodies and delineation of wetlands along the underground portion of the proposed transmission cable route. To date, field investigations have been conducted along approximately 89.4 miles of CP and CSX rights-of-way from October to December 2009 and April to June, 2010. Wetland Delineation Reports, including detailed information on wetlands and watercourses identified during field investigations as well as wetland mapping, are provided in the Application, Appendix C (Joint Proposal Exhibit 17), and the Supplement, Attachment B (Joint Proposal Exhibit 28). NWI and NYSDEC wetlands along the entire route are depicted in Figure 2-1.

5.1.1 Existing Waterbodies

The existing waterbodies traversed by the HVDC Transmission System are within the Lake Champlain, upper Hudson River, Mohawk River, lower Hudson River, Harlem River, and East River. The bypass of the lower Lake Champlain and the northernmost portion of the underground route along the CP railroad right-of-way are in the Lake Champlain Basin. The underground portions of the proposed transmission cable corridor are primarily in the upper Hudson, Mohawk, and lower Hudson River Basins. The Hell Gate Bypass and Luyster Creek converter station are within the Atlantic Ocean Basin in New York.

The underwater cable will be primarily buried in the bottom sediments of Lake Champlain, the Hudson River, Harlem River, and East River. Detailed information on water quality, sediments, bathymetry, fisheries, and other environmental characteristics of these resources is provided in Sections 6 and 7 of this application. The remaining freshwater waterbodies that have been identified along the underground portion of the proposed transmission cable corridor are listed in Table 5-1. Waterbodies on this table were initially identified based on USGS 7.5-minute topographic mapping and aerial photography. Waterbodies crossed along the CP railroad and portions of the CSX railroad rights-of-way were confirmed during field surveys based on the presence of defined bed and banks and/or an observable ordinary high water mark (OHWM) caused by to erosion, destruction of terrestrial vegetation, or other defined features. Waterbodies along the remaining portions of the route where field surveys have not been completed were identified using NYSDEC linear hydrography data and are also listed in Table 5-1.

5.1.1.1 Water Quality

Freshwater and saline surface waters are classified by the NYSDEC under regulation 6 NYCRR Part 701 according to their designated best uses. New York State Water Quality Standards promulgated under 6 NYCRR Part 703 sets the required water quality criteria that must be met to support each of the best use, such as maximum coliform or minimum dissolved oxygen levels. Best uses include drinking water supply, primary and secondary contact recreation, fishing, and fish, shellfish, and wildlife propagation. Table 5-1 lists the water quality classifications of waterbodies crossed along the underground portions of the transmission cable corridor. More detailed information on water quality in Lake Champlain, the Hudson River, Harlem River, and East River is provided in Section 6.

Waterbodies that do not meet the criteria associated with their use classification are considered to be impaired. The NYSDEC maintains the Waterbody Inventory and Priority Waterbodies List (WI/PWL), a database that contains information on water quality, the ability of waters in New York State to support their use classifications, and known or suspected sources of contamination. The WI/PWL list is used to prepare the New York State Water Quality Report (Section 305(b) Report) and the 303(d) list of impaired waters, which are part of state water quality assessment requirements under the CWA. Major sources of water quality impairment in New York State include industrial and municipal point sources, nonpoint sources such as agricultural runoff, contaminated sediments, and stream bank erosion.

Based on the New York State WI/PWL (NYSDEC 2003; NYSDEC 2007a; NYSDEC 2008a; NYSDEC 2009b) and the Final 2008 303(d) list (NYSDEC 2008b), the following waterbodies along the underground transmission cable corridor were identified with water quality impairments. Lake Champlain and some of its tributaries are listed as impaired, due to the presence of mercury, phosphorus, PCBs, and problem species (lamprey and zebra mussels). Known sources of pollution include atmospheric deposition, agriculture, and contaminated sediments. Along the CP railroad, Woods Creek and other minor tributaries to the Champlain

Canal are listed as impaired due to dissolved oxygen and oxygen demand, excess nutrients (phosphorus), and pathogens. Municipal wastewater from Whitehall is a known source of contamination; agricultural runoff and stream bank erosion are suspected contributors. The main stem of the upper Hudson River is impaired due to sediments contaminated by PCBs, which is the focus of an ongoing dredging and cleanup project. Further information on PCBs in the Hudson River is provided in Section 6.

Several other waterbodies are included in the WI/PWL as having stress or minor impacts to water quality, although they are not considered impaired. North Fork Snook Kill, Snook Kill, Geyser Brook, tributaries to the Mohawk River, the Mohawk River Main Stem, Poentic Kill, Normans Kill, and Vly Creek are waters crossed by the underground route that may have minor water quality issues caused by factors such as urban runoff, agricultural runoff, erosion, and/or municipal discharges.

5.1.1.2 Federal and State Designations

Three of the waterbodies along the proposed transmission cable corridor are included in the Nationwide Rivers Inventory (NRI). The NRI is a listing of river segments in the United States that are considered to possess one outstandingly remarkable natural or cultural values, which are judged to be of more than local or regional significance (NPS 2008). Kayaderosseras Creek and Normanskill are both listed on the NRI for stream segments crossed by the underground transmission cable corridor. Kayaderosseras Creek is crossed along the CP railroad right-of-way near Ballston Spa. The Facility corridor crosses Norman's Kill along the CSX railroad right-of-way near Albany. Both of these streams are listed on the NRI for outstanding recreational value, due to their proximity to urban centers in Albany, Saratoga, and Schenectady, and their diversity of flow gradients, which includes Class IV rapids (NPS 2008).

The underwater cable deviation zone crosses several NRI-listed segments of the Hudson River, in portions of Ulster, Columbia, Dutchess, and Greene counties. NRI segments of the Hudson are designated for their exceptional historic value, hydrologic value as free-flowing, sparsely developed areas of the Hudson River Corridor, and Significant Coastal Fish and Wildlife Habitat ("SCFWH").

No river segments along the Facility route are protected as New York State Wild, Scenic, and Recreational Rivers (NYSDEC 2010c).

5.1.1.3 Fisheries

Freshwater rivers, streams, lakes and ponds along the underground portion of the cable corridor support both warmwater and coldwater fisheries. Some of these streams are designated as coldwater trout streams or trout spawning areas under New York State Water Quality Standards, including Chubb's Brook, tributaries to Pease Brook, North Branch Snook Kill, Geyser Brook, tributaries to Alplaus Kill, tributaries to the Mohawk River, tributaries to Normanskill, Vly Creek, and Lake Tiorati Brook. While these water quality designations do not necessarily mean that trout habitat is present, it is likely that some waterbodies crossed by the Facility do support coldwater fish communities. Coldwater fisheries typically require cool, clean water below 72°F.

Most other perennial waterbodies along the route contain warmwater fisheries. Smaller intermittent and ephemeral streams identified along the transmission cable corridor are unlikely to have significant fish populations. Detailed information on fisheries along the underwater transmission cable route is provided in Section 7.

Species typical of warmwater fish communities that may be present in streams crossed by the proposed underground transmission cable route include largemouth bass (*Micropterus salmoides*), brown bullhead (*Ameiurus nebulosus*), fallfish (*Semotilus corporalis*), creek chub (*Semotilus atromaculatus*), golden shiner (*Notemigonus crysoleucas*), fathead minnow (*Pimephales promelas*), yellow perch (*Perca flavescens*), trout-perch (*Percopsis omniscomaycus*), pumpkinseed (*Lepomis gibbosus*) and northern pike (*Esox lucius*). Coldwater fisheries may have resident brook trout (*Salvelinus frontalis*), lake trout (*Salvelinus namaycush*), brown trout (*Salmo trutta*) and/or rainbow trout (*Oncorhynchus mykiss*) (NYSDEC 2010d), as well as other cold water tolerant species such as smallmouth bass (*Micropterus dolomieu*).

Ballston Lake and the surrounding area in Saratoga County are mapped by the NYSDEC as a warm water fish concentration area. Although the underground transmission cable corridor does not cross Ballston Lake itself, several tributaries to Ballston Lake are crossed just upstream. Ballston Lake is listed by the NYSDEC as a location for carp (*Cyprinus carpio)* fishing (NYSDEC 2010e).

5.1.2 Existing Floodplains

Most of the HVDC Transmission System will be located along existing waterways in Lake Champlain, the Hudson, Harlem River and East River. Where underground bypass routes are required, the Facility will cross floodplains associated with major river and stream crossings. The Federal Emergency Management Agency (FEMA) is responsible for mapping and delineating floodplains and determining the flood risk for susceptible areas. A 100-year floodplain is determined based on the area with approximately one (1) percent or greater probability of flooding per year and corresponds to the FEMA Zone A.

In developing the Application, the Applicants reviewed FEMA Flood Insurance Rate Mapping (FIRM) for Saratoga and Albany counties, as well as the individual FIRMs for the Towns of Fort Ann, Kingsbury, Whitehall, Fort Edwards and Rotterdam, the Villages of Fort Ann and Fort Edwards, and the City of Schenectady.

In Washington County, portions of the underground bypass routes along the CP and CSX railroad rights-of-way will cross FEMA-mapped floodplains associated with the Hudson River, North Branch Snook Kill, Snook Kill, Putnam Brook, Geyser Brook, Kayaderosseras Creek, Mourning Kill, Ballston Lake, the Mohawk River, Poentic Kill, Normanskill, an unnamed tributary to Normanskill and Black Creek.

For the converter station, portions of the Luyster Creek property are located within mapped Flood Hazard Areas AE and X (see Figures 2-8A and 2-8B). Any facilities sited within the areas of mapped Flood Hazard will be designed to avoid flood hazard damage on the site or at any other properties.

5.1.3 Existing Freshwater Wetlands

Freshwater wetlands in the vicinity of the Facility were initially identified based on USGS 7.5-minute topographic mapping, NWI mapping, NYSDEC freshwater wetlands mapping and aerial photography (Figure 2-1). Wetlands crossed along the CP and portions of the CSX railroad rights-of-way were also field delineated according to the Federal Routine Determination Method presented in the USACE Wetlands Delineation Manual (USACE 1987). The Wetland Delineation Report, including detailed information on wetlands and watercourses identified during field investigation, is provided in the Application, Appendix C (Joint Proposal Exhibit 17), and the Supplement, Attachment B (Joint Proposal Exhibit 28). Most wetlands and waterbodies that have been identified in the vicinity of the Facility are regulated are under both federal USACE and NYSDEC jurisdiction; however, because the NYSDEC primarily regulates mapped wetlands at least 12.4 acres in size, some smaller wetlands along the Facility corridor may not be jurisdictional under the New York FWA. Both USACE jurisdictional and New York State jurisdictional wetlands have been considered by the Applicants in the assessment of impacts to wetland resource areas.

Under the New York FWA, wetlands are classified into one of four classes, with Class I representing the most beneficial and Class IV representing the least beneficial. These classifications are made based on a variety of criteria, including but not limited to special ecological associations, TE species and RTE plants, hydrology of adjacent waterbodies, the presence or absence of invasive species, wildlife, cultural significance, aesthetics and landscape features. The underground transmission cable corridor crosses NYSDEC wetlands in all four classes.

5.1.3.1 Wetland Community Types

The *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) describes a hierarchical method of classification for wetlands and waterbodies. Under the Cowardin classification, all wetlands and deepwater habitats belong to one of the following major systems: marine, estuarine, riverine, lacustrine, or palustrine. Vegetated freshwater wetlands and small ponds are classified as part of the palustrine system. Within the palustrine system, vegetated wetlands may be dominated by emergent, scrub-shrub, or forested vegetation; all others are generally classed as open water wetlands. Palustrine wetland communities in New York State are described in further detail by Edinger et al. (2002).

Table 5-2 provides a list of the wetlands that have been identified along the route. Along the CP and portions of the CSX railroad rights-of-way, where field delineation has been conducted, wetland boundaries from the field data have been used to calculate potential impacts to wetlands from construction of the Facility. In other locations, such as along the remainder of the CSX railroad right-of-way and the Route 22 right-of-way, NYSDEC and NWI wetland maps have been used to estimate potential wetland impacts. The Applicants note that in the Application submitted in March of 2010, the analysis of wetland acreage for areas where no field delineations had occurred only considered NYSDEC wetland maps.

Palustrine Emergent Wetlands

The palustrine emergent (PEM) wetland cover type is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al. 1979). Freshwater emergent wetlands observed or likely to occur along the transmission cable corridor consist of shallow emergent marshes, deep emergent marshes, and sedge meadows. Wetlands in disturbed, human-impacted environments may consist primarily of reedgrass/purple loosestrife marshes. PEM wetlands may occur as a single dominant wetland cover type, or may be co-dominant with other wetland types. In such cases, emergent wetlands may naturally grade into shrub swamps or else they may exist within maintained areas, such as rights-of-way, that are located directly adjacent to unmaintained forested or shrub swamps.

Shallow emergent marshes occur on mineral soils or deep muck soils that are permanently saturated and seasonally flooded. Water depths range from 6 inches to 3.3 feet during flood stages (Edinger et al. 2002). Characteristic vegetation of shallow emergent marshes within the Facility area includes bluejoint grass (*Calamagrostis canadensis*), smartweeds (*Polygonum* spp.), cattails (*Typha* spp.), sedges (*Carex* spp.), goldenrods (*Solidago* spp.), spotted joe-pye-weed (*Eupatorium maculatus*), reed canary grass (*Phalaris arundinacea*), scouring rush (*Equisetum hyemale*), sensitive fern (*Onoclea sensibilis*), and soft rush (*Juncus effusus*). Invasive species observed within the shallow emergent marshes include common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*).

Deep emergent marshes occur on mineral soils or fine-grained organic soils with water depths ranging from 6 inches to 6.6 feet (Edinger et al. 2002). Emergent vegetation observed within deep emergent marshes in the Facility survey area includes cattails, bur-weeds (*Sparganium* spp.), bulrushes (*Scirpus* spp.), and bluejoint grass. Common reed and purple loosestrife have also been observed within some the deep emergent marshes along the transmission cable route.

Reedgrass/purple loosestrife marshes consist of disturbed marshes where common reed or purple loosestrife has become dominant (Edinger et al. 2002). This community commonly occurs within ditches along the rail bed, as well as within other disturbed areas adjacent to the railroad rights-of-way.

Palustrine Scrub-Shrub Wetland

The scrub-shrub (PSS) wetland cover type includes areas that are dominated by saplings and shrubs that are less than 20 feet tall (Cowardin et al. 1979). PSS wetlands observed in the Facility area are classified by Edinger et al. (2002) as shrub swamps, dominated by silky dogwood (*Cornus amomum*), gray dogwood (*Cornus foemina* ssp. *racemosa*), red osier dogwood (*Cornus sericea*), honeysuckle (*Lonicera* spp.), and speckled alder (*Alnus incana* ssp. *rugosa*). Other vegetation observed includes willows (*Salix* spp.), meadowsweet (*Spirea latifolia*), highbush blueberry (*Vaccinium cormybosum*), winterberry (*Ilex verticillata*), spicebush (*Lindera benzoin*), elderberry (*Sambucus canadensis*), gray birch (*Betula populifolia*), wild raisin (*Viburnum cassinoides*), and northern arrowwood (*Viburnum recognitum*). Some PSS wetlands were dominated by invasive species, including dense stands of honeysuckle (*Lonicera* spp.) and/or buckthorn (*Frangula alnus* and/or *Rhamnus cathartica*). PSS wetlands may occur as a single dominant wetland cover type, or as co-dominant with PEM or forested wetlands when these other plant community types exist within areas of the wetland.

Palustrine Forested Wetland

Forested wetland (PFO) cover types are dominated by trees and shrubs that have developed a tolerance to a seasonal high water table. In order to be characterized as forested, a wetland must be dominated by trees and shrubs that are at least 6 meters tall (Cowardin et al. 1979). Forested wetlands typically have a mature tree canopy, and depending upon the species and density, can have a broad range of understory and groundcover community components. Forested wetland communities along the transmission cable route include primarily red maple-hardwood swamps and floodplain forests (Edinger et al. 2002). PFO wetlands may occur as a single dominant wetland cover type or as co-dominant wetland type when PSS or PEM areas also exist within the wetland.

Red maple-hardwood swamps occur in poorly drained depressions, usually on inorganic soils. Red maple (*Acer rubrum*) is either the only dominant tree species, or is co-dominant with one or more hardwoods (Edinger et al. 2002). Hardwood species observed along the transmission cable corridor in red maple swamps include green ash (*Fraxinus pennsylvanica*) and black ash (*Fraxinus nigra*), American elm (*Ulmus americana*), northern red oak (*Quercus rubra*), and white pine (*Pinus strobus*). Shrubs species commonly observed within red maple-hardwood swamps in the Facility survey area include dogwoods, honeysuckles, speckled alder, and American hornbeam (*Carpinus caroliniana*). The herbaceous layer typically includes sensitive fern, cinnamon fern (*Osmunda cinnamomea*), tussock sedge (*Carex stricta*), goldenrods, reed canary grass, and royal fern (*Osmunda regalis*). Invasive species observed within red maple-hardwood forests included honeysuckle, buckthorn, and reed canary grass.

Floodplain forests typically occur on mineral soils on low terraces of river floodplains and river deltas (Edinger et al. 2002). Tree species observed within this community type in the Facility survey area include green ash, cottonwood (*Populus deltoides*), red maple, silver maple (*Acer saccharinum*), American elm, box elder (*Acer negundo*), shagbark hickory (*Carya ovata*), burr oak (*Quercus macrocarpa*) and swamp white oak (*Quercus bicolor*). Shrubs included dogwoods, speckled alder, honeysuckle, American hornbeam, and buttonbush (*Cephalanthus occidentalis*). Sensitive fern, cinnamon fern, goldenrods, ostrich fern (*Matteuccia struthiopteris*), horsetails (*Equisetum* spp.), and sedges are characteristic of the herbaceous layer. Invasive honeysuckles and buckthorn were commonly observed in floodplain forests along the transmission cable route.

Palustrine Open Water

Besides vegetated wetlands, a few scattered small ponds are located along the transmission cable route, adjacent to the railroad right-of-way. These wetland areas are characterized by a vegetation cover of less than 30 percent, although there may often be emergent or shrubby vegetation bordering the open water areas. Ponds along the transmission cable route may also have submerged vegetation, including such plants as pondweeds (*Potamogeton* spp.), water milfoils (*Myriophyllum* spp.), naiad (*Najas flexilis*), water lobelia (*Lobelia dortmanna*) and bladderworts (*Utricularia* spp.) (Edinger et al. 2002). Pond substrates may be silt, mud, cobble, or sand.

5.1.3.2 Buffer Zones

In addition to wetlands, the FWA also provides protection for a 100-foot Adjacent Areas to provide a buffer zone to freshwater wetlands. For most wetlands along the transmission cable route, the Adjacent Area largely consists of the railroad bed, embankment, and disturbed area alongside the railroad. Other ecological communities that may be within the Adjacent Area are described in detail in Section 4.

5.1.4 Avoidance, Minimization and/or Mitigation of Potential Impacts

It is anticipated that construction and operation of the Facility will result primarily in temporary impacts to wetlands and waterbodies along the underground portions of the Facility route, including the CP and CSX railroad rights-of-way and the Route 22 bypass of lower Lake Champlain. This may include areas where the edge of the cleared construction corridor traverses a wetland or riparian area or where vegetation clearing and ground disturbance occurs in adjacent uplands. In limited areas, permanent conversion of forested wetland to scrub-shrub wetland may occur in those areas where vegetation management is needed during operation. The Applicants will develop a Vegetation Management Plan as part of the EM&CP to further avoid, minimize and/or mitigate these impacts.

The construction sequence along the underground route will typically consist of site preparation and vegetation clearing within the construction corridor within the railroad right-of-way, followed by the excavation of a trench approximately four feet wide and four to five feet deep. Erosion and sediment controls will be installed, as needed, prior to construction. During construction spoil will be stored within the construction corridor immediately adjacent to the trench, or within designated extra work areas. Construction equipment will typically operate from the access road adjacent to the track. Once a trench is excavated, the cable will be laid and the trench will be backfilled with native spoil material. Any excess spoil will be removed from the right-of-way and disposed of properly offsite. Following construction, the Applicants will conduct final grading to restore original contours, as needed, and will seed impacted areas with a temporary seed mix to stabilize soils and establish vegetation cover. Further details on construction methods are provided in Section 1. Potential impacts and avoidance and/or minimization measures for water quality and fisheries of the major waterbodies affected by underwater cable construction are detailed in Sections 6 and 7, respectively.

5.1.4.1 Waterbodies

Waterbody crossings along the railroad rights-of-way will typically be constructed by trenching across the waterbody, followed by the restoration of the bed and banks. Intermittent and ephemeral streams may be dry or may have very low flow at the time of crossing. For these crossings, the Applicants will excavate an open cut through the stream without any isolation of the stream flow. Where perennial or other significant stream flows are present, the Applicants may use a dry-ditch method to isolate the work area from the flow of water. These dry-ditch crossings will typically be completed by installing cofferdams upstream of the work area, and either pumping water around the construction area, or diverting the stream flow into one or more flume pipes. In some cases, large waterbodies may be crossed by the HDD method, which allows installation without trenching or other surface disturbance. Alternately, where a large waterbody is crossed by a railroad bridge, the cables may be placed aboveground along the railroad trestle.

It is expected that during construction, potential short-term impacts on water quality may be caused by localized increases in turbidity and downstream sedimentation resulting from trenching within the waterbody. Sediment may also be introduced into waterbodies due to runoff of sediment-laden stormwater from adjacent construction areas and/or soil stockpiles. Increased turbidity has the potential to reduce light levels in aquatic habitats and may result in temporary changes to water chemistry, including effects on pH and dissolved oxygen. Reduced dissolved oxygen levels result if lowered light levels decrease the oxygen production of photosynthetic organisms, and/or biochemical oxygen demand is increased by sedimentation. Fish and other mobile organisms are expected to avoid localized areas that are temporarily impacted by construction. Less mobile or sessile aquatic organisms may be impacted by changes in water quality.

Water quality impacts will be avoided and/or minimized by using construction techniques like HDD in some areas and by immediately restoring and stabilizing the streambed and banks once construction is completed. At crossings with significant stream flows, the use of dry-ditch crossing methods instead of open cut methods avoids and/or minimizes potential impacts from turbidity and sedimentation, because disturbed sediments within the construction area do not become re-suspended. Long-term impacts on water quality or on aquatic organisms are not anticipated. Water quality and other stream attributes should return to pre-construction conditions within a short period after restoration of the bed and banks.

To avoid increases in erosion and sedimentation into waterbodies from land disturbance in nearby construction areas, the Applicants will install temporary and permanent erosion control measures along the construction corridor and adjacent to soil stockpiles, as needed, and will manage construction stormwater in accordance with the SWPPP for the Facility. A SWPPP will be prepared prior to construction as part of permitting and compliance under the SPDES and the development of the EM&CP.

Some clearing of riparian vegetation adjacent to waterbodies within the construction corridor may be required to conduct trenching and cable installation activities. Clearing of vegetation along stream banks has the potential to reduce the bank stability and increase erosion. Adverse impacts will be avoided and/or minimized through the use of temporary and permanent erosion control measures, and by restoring, stabilizing, and seeding stream banks as soon as possible once construction is completed.

Potential impacts to surface water quality can also result from accidental leaks or spills of oil, petroleum and/or other hazardous materials during refueling or maintenance of vehicles and equipment. Spills or leaks of oil, fuel, or hazardous materials have the potential to impact waters outside of the immediate construction area, if these substances are carried by surface waters, stormwater runoff, or groundwater. Additionally, although use of the HDD methods usually avoids impacts at waterbody crossings, HDDs require the use of drilling fluid, and occasionally this can result in the potential for an inadvertent release of drilling fluid to surface waters.

To avoid and/or minimize impacts from accidental leaks and spills, construction crews will have appropriate on-site personnel to control the source of the spill, release or leak and contain the spill, release or leak in as small an area as possible. Appropriate equipment, supplies and materials for containment and cleanup of oil and hazardous substances will be kept at the construction site(s) (i.e., construction site work area with ongoing construction activities and construction staging area) in the event of a spill. To reduce the likelihood of a spill, the Applicants will avoid storing hazardous materials, chemicals or lubricating oils, or refueling vehicles and equipment within 100 feet of the edge of a waterbody or wetland, unless no reasonable alternative is available.

It is expected that impacts from operation of the transmission cables will be limited to periodic maintenance and/or repair activities. Trenching or excavation may be occasionally required near waterbodies to conduct repairs. The Applicants will develop protocols for maintenance and emergency repair activities to avoid and/or minimize impacts consistent with the requirements of their Certificate and any applicable state and federal permits and conditions.

5.1.4.2 Floodplains

Although temporary impacts from construction activity will occur within floodplains, since the transmission cables will be installed belowground, no impacts to flood storage are anticipated. No permanent aboveground alterations or new impervious surfaces that could potentially impact flood storage, infiltration, or flooding hazard will be associated with the underground transmission cable. The new proposed Luyster Creek converter station is within or near to mapped floodplains and will therefore be designed to avoid flood hazard damage on the site or at any other properties.

5.1.4.3 Freshwater Wetlands

Approximately 49.9 acres of wetland have been delineated in the field along the route and NWI and NYSDEC freshwater wetlands mapping have shown an additional 6.2 acres. Of the total of 56.1 acres, approximately 10.8 acres have been identified as forested wetland. No fill or permanent alteration to wetlands will result from the Facility in general and it is anticipated that wetland hydrology, vegetation, and water quality will return to pre-construction conditions in most areas when construction is completed. However, in limited areas, forested wetland cover may be converted to a scrub-shrub community as part of the Applicants' Vegetation Management Plan. During operation of the Facility, activities associated with this plan will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the transmission cables and/or selective cutting to prevent the establishment of large trees directly over the cables. Any herbicide use will be selected based on site sensitivity, target species composition and density, and treatment methods. Herbicides will not be used in certain areas if site sensitivity, regulations, permit conditions, or target species composition or height recommend otherwise. Herbicides will only be applied under the direct supervision of a

NYSDEC Certified Pesticide Applicator who either owns or is employed by a business or agency registered with NYSDEC for the purpose of herbicide application. Any vegetation management activities currently conducted by the railroads within the right-of-way will continue following the construction and operation of the underground transmission cable.

The construction sequence in wetlands will generally be similar to upland construction, and will include site preparation, vegetation clearing, installation of erosion and sediment controls, trenching, backfilling, and corridor restoration. During construction, it is expected that temporary impacts to wetlands will occur within the construction corridor. Temporary, localized impacts may also occur on lands adjacent to wetlands due to changes in wetland hydrology and water quality. Localized increases in turbidity within the wetland may occur due to ground disturbance within the wetland.

Erosion and sediment-laden stormwater runoff from disturbed areas or spoil piles in immediately adjacent uplands have the potential to affect water quality in wetlands. To avoid and/or minimize these impacts, the Applicants will install and maintain erosion control barriers between upland construction areas and wetlands as necessary to prevent sedimentation into wetlands. The Applicants will manage construction stormwater in accordance with the SWPPP for the Facility. A SWPPP will be prepared prior to construction as part of permitting and compliance under the SPDES and as part of the EM&CP.

During construction, spoil will be stored within the construction corridor immediately adjacent to the trench or within designated extra work areas. The Applicants will avoid and/or minimize the storage of spoil within wetlands; however, due to the space constraints along the railroad right-of-way, it is anticipated that some spoil storage in wetland areas may be required. In these areas, soil will be temporarily stockpiled on construction matting or geo-textile fabric to be used to backfill the trench. Any excess spoil will be removed and disposed of properly offsite. The Applicants will segregate topsoil in wetlands, except when standing water or saturated soils are present, to prevent the mixing of topsoil with subsoil. This facilitates wetland revegetation by maintaining physical and chemical characteristics of the surface soil and preserving the native seed bank.

If heavy vehicles and equipment operate within wetlands, soils could be impacted by compaction and rutting, which may affect hydrology and interfere with revegetation success. Potential impacts to wetland soils are variable depending on the site-specific conditions present at the time of construction, including the water levels, the degree of soil saturation, and the bearing capacity of the soils. In general, the Applicants anticipate that construction equipment will operate primarily from the railroad bed, railroad access road, embankment, or other upland areas. If any construction equipment needs to operate within saturated wetlands that are likely to be impacted by soil compaction or rutting, based on conditions at the time of construction, the Applicants will use equipment mats or low-ground-pressure tracked vehicles to avoid and/or minimize impacts to wetland soils. If dewatering is required within the excavated trench, water will be discharged to a well-vegetated upland area, a properly constructed dewatering structure, or a filter bag.

Original surface hydrology in disturbed wetland areas will be re-established by backfilling the trench and grading the surface to original contours, as needed. The Applicants will seed the right-of-way to establish temporary cover and stabilize soils. Wetlands will then be allowed to revegetate naturally. Wetlands will be backfilled with native wetland soils that were segregated during construction to speed recruitment of existing native wetland vegetation from the seed bank. Emergent wetland vegetation is expected to return quickly following construction and woody species will return more slowly. Forested wetlands, where not maintained, are expected to go through several stages of successional vegetation before returning to the pre-construction vegetation cover type. To assist in the recovery of woody species, the Applicants will avoid and/or minimize removal of roots and stumps in cleared areas outside of the cable trench, unless required for safety, in order to allow resprouting of woody species.

Prior to construction, the Applicants will obtain permits from USACE under Section 10 for the Rivers and Harbors Act and Section 404 of the CWA. Additional avoidance, minimization and/or mitigation measures for potential impacts to wetlands, if required, will be determined during the permit application process in consultation with USACE. The Facility will be constructed in accordance with state and federal permits and any applicable permit conditions.

5.2 Tidal and Estuarine Wetlands

Tidal and estuarine wetlands along the transmission cable route were identified on the basis of USGS 7.5-minute topographic mapping, NWI mapping, NYSDEC tidal wetlands mapping (Figure 2-1) and aerial photography. Tidal and estuarine wetlands include fresh, brackish, and saline wetlands that occur primarily along the lower Hudson River, Harlem River and East River.

5.2.1 Existing Estuarine/Tidal Wetlands

Tidal and estuarine wetlands in New York are regulated under the Tidal Wetlands Act and its implementing regulations (6 NYCRR 661). The NYSDEC (NYSDEC 2010f) classifies tidal wetlands into the following categories:

- **Coastal shoals, bars and mudflats**, defined as the tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is not vegetated.
- **Littoral Zone**, defined as the tidal wetland zone that includes all lands under tidal waters which are not included in any other category.
- **Formerly Connected**, defined as the tidal wetland zone in which normal tidal flow is restricted by man-made causes. *Phragmites* spp. is the dominant vegetation.
- **Vegetated Coastal Shoals, Bars, and Mudflats**, defined as the tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is vegetated.
- **Broad-Leaf Vegetation**, defined as the vegetated tidal wetland zone that includes all lands that generally receive a daily flushing from fresh tidal water. This area is generally lower than the graminoid vegetation area and is characterized by broad leaf emergent vegetation.

- **Intertidal Marsh**, defined as the vegetated tidal wetland zone lying generally between average high and low tidal elevations in saline waters. The predominant vegetation in this zone is low marsh cordgrass (*Spartina alterniflora*).
- **Fresh Marsh**, defined as the tidal wetland zone primarily in the upper tidal limits of the tidal zone. Species normally associated with this zone include narrow-leaved cattail (*Typha angustifolia*), tall brackish water cordgrass (*Spartina pectinata*), and the more typically emergent fresh water species.
- **Graminoid Vegetation**, defined as the tidal wetland zone that includes all lands that receive at least periodic flushing from fresh water. This area is generally higher than the broad leaf vegetation area. The lower elevated portions of this area may receive daily flushing and the higher elevations periodic flushing from storm tides. It is characterized by graminoid vegetation such as cattail.
- **High Marsh**, defined as the normal upper most tidal wetland zone usually dominated by salt meadow grass and spike grass. This zone is periodically flooded by spring and storm tides and is often vegetated by low vigor (*Spartina alterniflora*) and seaside lavender (*Limonium carolinianum*). Upper limits of this zone often include black grass (*Juncus gerardi*) and chairmaker's rush (*Scirpus* spp.) marsh elder (*Iva frutescens*) and groundsel bush (*Baccharis halimifolia*).
- **Swamp Shrub**, defined as all land that receives periodic inundation from tidal fresh waters. Characterized by shrubs such as alder (*Alnus* spp.), buttonbush (*Cephalanthus occidentalis*), and bog rosemary (*Andromeda glaucophylla*).
- **Swamp Tree**, defined as all land that receives periodic inundation from tidal fresh waters and is characterized by trees such as red maple (*Acer rubrum*) and willows (*Salix* spp.).
- **Fern Marsh**, defined as all land that receives periodic inundation from tidal fresh waters. Characterized by ferns such as cinnamon fern (*Osmunda cinnamomea*) and sensitive fern (*Onoclea sensibilis*).
- **Dredged Spoil**, including all areas of fill material.
- **Dead Tree Area**, defined as areas where dead trees are dominant.
- **Default Area**, including all areas awaiting classification into one of the above categories.

In addition to the above categories, all tidal wetlands have an Adjacent Area that extends 300 feet or up to an elevation of 10 feet from the landward edge of the tidal wetland (NYSDEC 2010f).

Tidal wetlands in New York are mapped as part of the New York State Official Tidal Wetlands Inventory. Figure 2-1 depicts the mapped tidal wetlands along the transmission cable route. In general, tidal wetlands in the Facility area occur along the Hudson River south of the CSX railroad landfall in Greene County, the Harlem River and East River. Tidal wetlands along the Hudson River north of Poughkeepsie are freshwater (NYSDEC 2010g). Further south, tidal wetlands may be freshwater to brackish. Conditions depend on the location of the salt front, which fluctuates based on the variable flow volume of the Hudson River (see Section 6 for a more complete description of the Hudson River Estuary).

The underwater corridor in the Hudson River, Harlem River and East River is almost entirely located along tidal areas mapped by the NYSDEC as open water or littoral zone. In general, the Applicants intend to avoid and/or minimize impacts to vegetated and intertidal wetlands, such as mudflats and saltmarsh, along the underwater cable route by constructing within the subtidal zone and using HDD methods at all landfall locations. The underwater cable route along the Hudson River north of Yonkers travels within 150 feet of areas of mapped freshwater broad-leaved vegetation, coastal shoals, bars, and/or mudflats, from approximate MPs 204 to 208, 210 to 213, and 216 to 217. No significant areas of marsh or mudflat are present at the landfall connections to the Luyster Creek converter station.

The Hudson River National Estuarine Research Reserve is an important tidal wetland research facility located along the underwater cable route in the lower Hudson River. The research facility consists of four tidal wetland sites on the Hudson River Estuary including Stockport Flats in Columbia County, Tivoli Bay in Dutchess County, and Piermont Marsh and Iona Island in Rockland County. These areas provide habitat for a number of natural communities and serve as an important spawning and nursery ground for anadromous and freshwater fish.

5.2.2 Avoidance, Minimization and/or Mitigation of Potential Impacts

The Facility has been designed to avoid and/or minimize impacts to tidal and estuarine wetlands by installing the underwater portions of the transmission cables within the deeper subtidal zones and by using HDD construction methods for all landfall locations. The Facility route is located near the Hudson River National Estuarine Research Reserve but the cables will be located within the subtidal zone in this area; therefore, impacts to vegetated wetland or intertidal habitats will be insignificant.

In addition, the Applicants have proposed to cross freshwater tidal habitats between the Hudson River and the CSX railroad right-of-way using the HDD method, avoiding surface impacts to tidal wetlands at this location. Other cable landfall locations at the Luyster Creek converter station and Hell Gate Bypass will also be installed using the HDD method.

Although use of the HDD method for cable installation will avoid and/or minimize surface impacts to any wetland habitats that may be crossed, there is the slight chance of an inadvertent release during HDD operations. Depending on currents or wave action, some of the deposited drilling fluid can become suspended or more dispersed, with potential impacts on water quality in any nearby tidal or estuarine wetlands.

Impacts to tidal wetlands adjacent to the underwater route in the Hudson River could also occur if any water quality impacts are associated with underwater cable installation. It is expected that water jetting or trenching techniques will result in temporary impacts from the resuspension and transport of sediments. In any areas where sediments are contaminated, this could result in pollutants entering the waterbody. Water quality could also be impacted in the event of an accidental spill or leak from barges or vessels. BMPs and a SPCC Plan will be employed throughout construction and implemented in the case of a spill or leak to avoid and/or minimize any potential water quality impacts. Impacts to water quality from underwater cable installation techniques, as well as proposed avoidance and/or minimization measures, are discussed in further detail in Section 6.

Prior to construction, the Applicants will obtain permits from the USACE under Section 10 for the Rivers and Harbors Act and Section 404 of the CWA. Additional avoidance, minimization and/or mitigation measures for potential temporary impacts to wetlands, if required, will be determined during the permitting process in consultation with USACE. The Facility will be constructed in accordance with state and federal permits and permit conditions.

5.3 Groundwater

5.3.1 Existing Groundwater Resources

Along the underground portion of the route, groundwater is found in unconsolidated deposits of sand and gravel (surficial geology) and bedrock formations (see Section 3 for geologic resources). Aquifer recharge occurs from precipitation directly on the land, by seepage from the tributary streams, rivers, and lakes flowing across the aquifer, by subsurface flow from the till on the sides of the valleys, and by seepage from bedrock and deposits of low permeability adjacent to the aquifers.

In New York State, to enhance regulatory protection in areas where groundwater resources are most productive and most vulnerable, the New York State Department of Health (NYSDOH) identified 18 Primary Water Supply Aquifers (also referred as Primary Aquifers). These are defined as “highly productive aquifers presently utilized as sources of water supply by major municipal water supply systems.” No primary water supply aquifers were identified along the route.

The route and aboveground Facility locations were evaluated for the presence of sole-source aquifers. As defined by USEPA, a sole source aquifer is one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. The route crosses through the Schenectady-Niskayuna Sole Source Aquifer along the CP railroad in the vicinity of Rotterdam, Schenectady, Glenville, and Clifton Park.

The Federal Safe Drinking Water Act (“SDWA”) of 1974 established a program to designate sole source aquifers. A sole source aquifer, as defined by the USEPA, is an aquifer that is the sole or principal drinking water source, which if contaminated would create a significant hazard to public health (SDWA 1974). On August 20, 1982, the USEPA received a petition to designate the Schenectady-Niskayuna Aquifer System or “Great Flats Aquifer” as a sole source aquifer. On February 27, 1985, the USEPA determined that this aquifer system is the sole or principal source of drinking water for nine communities in Schenectady and Saratoga Counties (USEPA 2008).

The Schenectady-Niskayuna Aquifer System supplies water to the population of Schenectady County through municipal and private wells. The Schenectady-Niskayuna Aquifer System is approximately 20-miles-long and underlies approximately 30 square miles in the lower most part of the Mohawk River drainage basin (USEPA 2008). This aquifer consists of a complex series of discontinuous course sand and gravel deposits and is underlain by glacial till. Aquifer recharge occurs from precipitation directly on the land by infiltration from the tributary streams flowing across the aquifer and by subsurface flow.

Installation of the underground transmission cable mainly requires shallow excavation to a depth of approximately 4 to 5 feet. Therefore, the Facility is not anticipated to directly impact the Schenectady-Niskayuna Aquifer System. Furthermore, impacts will be avoided and/or minimized by the use of standard and specialized construction techniques.

5.3.2 Avoidance and/or Minimization of Potential Impacts

Groundwater resources will not be adversely affected as a result of the Facility. If groundwater is encountered during construction, de-watering methods will be incorporated to avoid and/or minimize impacts including discharging to well-vegetated upland areas and using properly constructed dewatering structures or filter bags. Site restoration techniques, such as soil compaction (addressed in Section 3), will prevent any localized impacts to groundwater recharge.

HDD will be used for transmission cable installation at some locations. This common technology is used to avoid and/or minimize environmental impacts for sensitive resource areas. As HDD is a trenchless method for installing conduit cable products, it is a preferred technology at many locations because surface disruption and earth removal is minimized. Dewatering and the subsequent management of groundwater is typically not required with this installation technique.

As part of the HDD process, pre-planning is an initial step. As part of pre-planning, locations will be assessed for the potential to encounter contaminated groundwater. If contaminated groundwater has been confirmed or is suspected during any initial geotechnical investigations completed prior the HDD installation work, all groundwater will be containerized and tested. Based on actual conditions, the groundwater may be treated prior to discharge back into the ground, or shipped offsite for treatment.

During the HDD process, drilling fluid will be used. Excess drilling fluid will be containerized in a lined pit or containment pond, or trailer mounted portable tank. Fluid will not be allowed to percolate to groundwater. The Facility will be constructed with an agency approved SPCC Plan or equivalent as well as Best Management Practices, which will be detailed further in the EM&CP, and the necessary materials will be maintained on site to handle small spills or releases in order to prevent impacts to groundwater resources.

At some locations, the blasting of bedrock may be required. Bedrock blasting is likely to increase bedrock fracturing near the blasting zone. Impacts in area close to a blasting zone have the potential to affect groundwater flow or temporarily increase turbidity in a nearby groundwater well. All blasting activity will be performed by licensed professionals according to strict guidelines designed to control energy release. Charges will be kept to the minimum required to break up the rock. Where appropriate, mats made of heavy steel mesh or other comparable material or trench spoil will be utilized to prevent the scattering of rock and debris. These activities will strictly adhere to all industry standards applying to controlled blasting and blast vibration limits.

6.0 PHYSICAL AND CHEMICAL CHARACTERISTICS OF MAJOR AQUATIC SYSTEMS

The following sections describe readily available historic data for water quality, bathymetry, and sediment physical and chemical characteristics along the route. This historic data was used to assess the potential impacts associated with cable installation. In the Spring of 2010, a marine survey to collect route specific bathymetric, side scan sonar and geotechnical data was conducted for a 300' wide corridor (see Supplement, Attachment E; Joint Proposal Exhibit 31). The data collected included geophysical, sediment and benthic surveys:

- Geophysical surveys were conducted to investigate existing bottom features in the lakes, rivers, and canals along the proposed route. Surveys were conducted using multi-beam bathymetry, side-scan sonar, magnetometer, and sub-bottom profile.
- The sediment survey was conducted to collect information on the existing sediment type and quality along the proposed route.
- The benthic survey was conducted to augment existing benthic community data and will be used to assess potential impacts associated with the installation of the underwater transmission cable.

Due to the level of detail provided in the Marine Route Survey report, as well as its reliance on associated figures and tables in its analysis, the report is not specifically discussed below as its results only provide confirmatory evidence of the overall assessment of impacts.

In addition to the marine survey, water quality modeling was completed in 2010 to evaluate the potential short term impacts of cable installation. The results of this modeling are discussed below.

6.1 Water Quality

The majority of the Facility falls within waters under the jurisdiction of the State of New York, which classifies freshwater and marine water bodies on their highest and best uses based on historic and current water quality. Uses are classified for recreational and commercial purposes as well as for fish health. Recreational uses include swimming, fishing, and boating. Commercial uses include shellfishing. Standards are based on a number of factors including total coliform, fecal coliform, and dissolved oxygen.

The majority of New York State waters support all intended uses (i.e., recreation, fishing). However, there are waterbodies that are affected by some level of water quality impact, use impairment, or are otherwise threatened by various activities. The NYSDEC Division of Water maintains an extensive inventory/database of these waters. The WI/PWL provides summaries of general water quality conditions, tracks the degree to which the waterbodies support (or do not support) a range of uses, and monitors progress toward the identification and resolution of water quality problems, pollutants, and sources.

Industrial and municipal point sources continue to be relatively minor sources of water use impairment, with their impact on water quality diminishing significantly in the past 30 years. The water quality problems and issues that are of greatest significance in New York State can be summarized as follows:

- Nonpoint sources (i.e., agricultural);
- Contaminated sediments (including priority organics (e.g., PCBs), pesticides and heavy metals in bottom sediments, and atmospheric deposition); and
- Streambank erosion (second most frequently cited source of water quality impact/impairment in rivers and streams).

Basin-wide assessments have been completed for the following drainage basins within the Facility study area; Lake Champlain, upper Hudson River and lower Hudson River (NYSDEC 2008b).

Water quality varies along the proposed underwater transmission cable route since it is located within a number of large waterbodies, including the freshwater of Lake Champlain and estuarine waters of the Hudson River, as well as the Harlem River and East River. Each waterbody has different physical factors, including water flows and circulation patterns, which are important forcing actions that are closely coupled with water quality.

Along the route, several agencies monitor water quality conditions; however, there is a great deal of variability in the scope and duration of these monitoring programs. In addition, most historic sampling programs analyzed chemical constituents covering a broad range of conventional pollutants and toxic contaminants using water quality grab samples that sparsely populate the spatial and temporal scales of interest. A summary of historical water quality data collected along the proposed route is shown in Table 6-1. Water quality concentrations are compared against state water quality standards.

6.1.1 Lake Champlain

Lake Champlain is one of the largest freshwater lakes in the United States. It is an ecologically diverse system that serves as a major recreational hub and a drinking water source. Like many large lakes, it receives municipal and industrial wastes as well as runoff from agricultural and urban areas, all of which contribute to recognized water quality problems within the lake and watershed. The Lake Champlain Basin Program, the Vermont Center for Clean and Clear, and the Vermont Department of Health, among others, use data generated through the Long-Term Water Quality and Biological Monitoring Program to identify water quality issues of concern and assess progress in reducing lake pollution (NYSDEC 2008b).

In July 2009, the NYSDEC Bureau of Watershed Assessment and Management Division of Water published the Lake Champlain Basin WI/PWL. Based on a review of historic water quality data and a water quality sampling program, NYSDEC listed Lake Champlain as an impaired water body, meaning that it frequently does not support appropriate uses based on its water quality classification. For Lake Champlain, shoreline waters (i.e., up to 30 foot depth contour) are generally classified as Class A and waters beyond the shoreline are Class AA. The waters between Crown Point Bridge and the Champlain Canal are designated as Class B. For Class A, AA and B waters, the minimum daily average dissolved oxygen concentrations should not be less than 5.0 milligrams per liter (mg/l), and at no time should the dissolved oxygen concentration be less than 4.0 mg/l.

Both Class A and Class AA waters are a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. These waters should be suitable for fish, shellfish, and wildlife propagation and survival. Class B waters have the same standards as Class A and Class AA, except they are not expected to be a water supply source for drinking or culinary/food processing purposes.

Lake Champlain has been sampled by USGS on a limited basis. No discharge (i.e., flow through the lake) data are available in the USGS's on-line database. Statistics for results at Ticonderoga (Lake Champlain), Crown Point (Lake Champlain), Whitehall (Champlain Canal), and Port Henry (Lake Champlain) are reported in Table 6-2. Generally water quality is good, with dissolved oxygen concentrations frequently approaching saturation, ranging between 7.9 and 8.4 mg/l. Lake Champlain stratifies in the spring and summer. The warmer, less dense, upper layer (epilimnion) of the Lake typically extends down about 33 feet in the Main Lake during the summer. Below this layer, there is a sharp transition in temperature called the "metalimnion" or "thermocline," to the much colder waters below, called the "hypolimnion."

The Lake Champlain Long-Term Water Quality and Biological Monitoring Program has conducted sampling annually since 1992. The project is conducted jointly by the Vermont Department of Environmental Conservation (VTDEC) and NYSDEC. The sampling network consists of 15 lake stations and 21 tributary stations (VTDEC et al. 2009). Station locations are shown in Figure 6-1. Discrete depth samples are taken and then composited to form vertically averaged samples. During seasons of thermal stratification, composite samples are collected from the epilimnion (i.e., top most layer) and hypolimnion (i.e., bottom layer). Sampling parameters include:

- Dissolved oxygen
- Total suspended solids (TSS)
- Secchi depth
- Temperature
- Conductivity
- Chlorophyll-a
- Inorganics
- pH
- Total organic carbon (TOC)
- Dissolved organic carbon
- Various forms of phosphorus and nitrogen
- Various forms of phytoplankton and zooplankton

Also, vertical profiles are collected at some lake sites using a multi-probe sonde unit for:

- Dissolved oxygen
- Temperature
- pH
- Specific conductance
- Total dissolved solids
- Turbidity
- Reduction/oxidation (redox) potential

In general, water quality results reveal mesotrophic conditions and phosphorus levels that are typically at or below the in-lake criterion (Tables 6-3 and 6-4). However, in the southern end of the lake, water quality results reveal eutrohphic conditions and phosphorus levels that are typically above the in-lake criterion. Averages, maxima and minima for 2008 are tabulated at all lake stations for temperature, chlorophyll-a, dissolved oxygen, Secchi depth, and total phosphorus in Table 6-3. Data for net phytoplankton, total nitrogen, alkalinity, chloride, and dissolved phosphorus are shown in Table 6-4.

In general, TSS values varied throughout Lake Champlain from 1992 - 2005 (Figure 6-2). In the northern and middle segments of Lake Champlain TSS values collected at five sampling stations were below 5 mg/l (Lake sampling stations 7 through 46). However, TSS values from two sampling stations in the south lake segment ranged from less than 5 mg/l to almost 20 mg/l (Lake sampling stations 2 and 4). Time series for yearly average TSS measurements are shown on a station-by-station basis in Figure 6-3. Secchi depths frequently average between 3 meters to 6 meters, especially in the middle third of the lake (Lake sampling stations 7 through 46), and are often lower in the other two thirds (Lake sampling stations 2, 4, 50, 51) (Figures 6-4). Time series for yearly average Secchi depth measurements are shown on a station-by-station basis in Figure 6-5.

The NYSDEC Rotating Intensive Basin Studies (RIBS) Routine Network monitoring program collects samples from the Richelieu River in Rouses Point, Clinton County near the Route 2 Bridge. Sampling typically includes macroinvertebrate community analysis, sediment assessment, macroinvertebrate tissue analysis, and toxicity testing, in addition to water chemistry. The most recent monitoring was conducted during 2003 and 2004. Biological samples, specifically macroinvertebrates, collected at this site and chemically analyzed for selected metals and polycyclic aromatic hydrocarbons (PAHs) showed none in concentrations above established guidance values. Water column chemistry indicated no contaminants to be present in concentrations that constitute parameters of concern and toxicity testing detected no significant mortality or reproductive effects on the test organism (LCBP 2009a).

6.1.1.1 Marine Quality Modeling

In October of 2010, the Applicants completed an analysis of potential impacts on water quality associated with the proposed cable installation via water jetting in Lake Champlain, using a three-dimensional hydrodynamic and time-variable water quality model to assess water quality impacts and compliance with water quality standards (see Joint Proposal Exhibit 84). The model was calibrated to the flow exiting the lake via the Richelieu River, and to measured vertical temperature profiles throughout the lake. The model computed the dissolved and solid fractions of contaminants that were likely to be present, using sediment core data collected during the Spring 2010 Marine Route Survey.

The maximum model-computed concentrations of TSS and the ten other modeled water quality constituents (arsenic, benz (a) anthracene, cadmium, chromium, copper, mercury, nickel, lead, Pyrene, and zinc) were compared to New York and Vermont's water quality standards. The comparisons showed that the effects of the proposed project would comply with NYS/Vermont water quality standards for eight of the ten modeled contaminants. Based on cable installation using the water jetting technique, the projected copper and zinc concentrations in limited extents (approximately 1 mile) and durations (less than 20 hours) of the southern portion of the lake would exceed Vermont's standards, which apply to the total (particulate and dissolved) metal concentration. New York State's standards for copper and zinc apply to the dissolved form and the projected dissolved concentrations for these contaminants were well below New York State's standards. The model also indicated that, while TSS concentrations along the majority of the route within Lake Champlain would be less than 200 mg/l, in the southern portion of the route the TSS concentrations would be greater than 200 mg/l for a total of 21.4 miles and for an approximate duration of 28 days.

In January of 2011, the Applicants produced results from the same model but under the assumption that the shear plow installation technology (see Section 1.1.2.2) would be utilized south of the Lake Champlain Bridge at Crowne Point (approximate Mile Point 73) (see Joint Proposal Exhibit 90). The TSS concentrations resulting from shear plowing between MP 73 and MP 110 were projected to be substantially lower than those shown when water jetting is the assumed installation technology within South Lake. For example, the maximum TSS concentration that occurs at MP 106.8 in the bottom model layer decreased from 1,080 mg/l in the water jet plow scenario to 15 mg/l under the shear plow scenario. Depth-average TSS concentrations associated with the combined water jetting and shear plow cable installation (*i.e.*, no background TSS) are less than 200 mg/l for the entire lake.

Similar trends of lower concentrations associated with the shear plow technology are shown for the other ten water quality constituents. Of particular interest are copper and zinc, as these two contaminants were projected to exceed the Vermont water quality standards in the southern portion of the lake. While the maximum total copper concentration predicted for the water jet plow model scenario was 22 ug/l at MP 106.8, at this same location the concentration is reduced to 0.4 ug/l under the shear plow model scenario. The maximum total copper and zinc concentrations in Lake Champlain for the shear plow model scenario were projected to be below both the Vermont and New York acute toxicity-based standard for these contaminants.

6.1.2 Hudson River

The proposed underwater transmission route follows the Hudson River south to the New York City region. Water quality within the Hudson River varies based on land use. Although the establishment of water quality regulations such as the CWA has led to gradual improvements to water quality, the surface waters are impaired in areas where bathymetry and/or shoreline alterations have affected the natural flows and flushing (USACE 2009). The most notable water quality problem in the Hudson River is reflected in the PCB contaminated sediments. This contamination is primarily the result of historic PCB discharges from the Fort Edward area associated with GE manufacturing facilities.

In the freshwater portion of the Hudson River, surface water quality classifications include Class A, B, and C waters. As the proposed cable route enters the estuarine waters of the lower Hudson River, at the border of Rockland and Westchester Counties, surface water quality classifications are Class SB. At the Bronx county border the Hudson River surface water quality classification is Class I. The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. Dissolved oxygen for Class SB waters shall not be less than a daily average of 4.8 mg/l, however there are times when dissolved oxygen can be less than 4.8 mg/l, but it shall not fall below 3.0 mg/l. The Hudson River in Westchester and the Bronx is on NYSDEC's list of impaired waterbodies, known as the 303(d) list (NYSDEC 2008b). The causes of the impairment are PCBs and other toxics. The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. Dissolved oxygen for Class I waters should not be less than 4.0 mg/l at any time. The dissolved oxygen standard for Class C waters, which applies to the relevant section of the Hudson River, is 5.0 mg/l (NYSDEC 2008b).

The Hudson River is a tidal estuary from its confluence with upper New York Bay to the Federal Dam at Troy. Hudson River tides are semi-diurnal, with two highs and two lows occurring within a 25-hour period. The mean tidal range is 1.37 meters at the Battery, 0.80 meters at West Point, and 1.56 meters at Albany (Cooper et al. 1988). The mean tidal amplitude at Albany increased from 1890 to 1950 from approximately 0.8 meters to its present-day amplitude as a result of navigation channel dredging which increased the river's cross-sectional area (Cooper et al. 1988).

The principle source of water quality data for the Hudson River is the USGS. The USGS collects and provides water quality data in non-tidal water bodies throughout all 50 states. Each state publishes an annual report of water level, discharge and water quality data for selected monitoring stations. The Hudson River section of the HVDC Transmission System extends from just south of Albany to the Harlem River, and USGS sampling extends from Fort Edward to the most downstream sampling by USGS at Hastings-on-Hudson. Summary data are presented in Table 6-5. Flows vary widely in response to precipitation and snowmelt. Consequently, suspended solids are often elevated during times of high runoff.

Freshwater flow is probably the single most important factor in determining physical, chemical, and biological processes within the Hudson River estuary. Freshwater flows can have a dominant effect on transport, dilution, mixing, and water quality. Under low flow conditions, saline water and associated marine species reach far up river while under high flow conditions, freshwater and freshwater organisms are found downstream. Sediment deposition and re-suspension, mobilization of chemicals including toxins, and the inflow of allochthonous detritus are all influenced by freshwater flows. Under low flow conditions, the Hudson River is generally well mixed vertically and there is only about a 10 percent difference in salinity found between the surface and bottom waters. Under high-flow conditions, freshwater overrides the salt layer and salinity differences of up to 20 percent can be established (Busby and Darmer 1970).

The major portion (about 75 percent under normal summer conditions) of freshwater flow enters the Hudson River estuary at its head at Troy. Flow at this location is gauged from the USGS Station at Green Island. Freshwater flows reaching this point are regulated by a series of dams, locks, and water supply reservoirs in the upper Hudson and Mohawk sub-basins. Over 70 percent of the remaining flow enters the estuary via tributaries near the upper end of the estuary. Abood et al. (1991) has presented relationships for determining the freshwater flow at Poughkeepsie and Manhattan from the Green Island flow.

The oscillating flows of water due to tides are ordinarily far greater than the freshwater flow. The tidal flow generally ranges from about 200,000 to 300,000 cubic feet per second (cfs) but may be as much as 494,000 cfs (Busby 1966). Consequently, freshwater flows can be masked by the much larger tidal oscillations.

Based on data from 1946 through 2007, the median annual freshwater input at Green Island is 9,790 cfs. On a seasonal basis, flows at Green Island are greatest in April, when snows melt and soils are moisture saturated. During this month, the median flow is 27,900 cfs (Table 6-6) with a daily range of 4,800 to 132,000 cfs. Flows decrease during the summer as the dry soils and vegetation absorb more of the precipitation. By August median flow is 5,200 cfs with a range of daily flows from 1,650 to 44,500 cfs. Flows increase again through the fall as vegetation growth and transpiration slow and the ground begins to freeze.

The Hudson River Estuary can be divided into four salinity zones: polyhaline (18 to 30 parts per thousand [ppt]), mesohaline (5 to 18 ppt), oligohaline (0.5 to 5 ppt), and freshwater tidal (<0.5 ppt). Salinity zones in the Hudson are determined by a combination of hydrographic factors, primarily the tidal surge of saline water upriver from the ocean and the magnitude of freshwater flow into the upper estuary. Under an average runoff regime the salt front (0.5 ppt) reaches Newburgh by late summer/early fall. During conditions of high freshwater runoff, usually during spring, the salt front may be pushed downriver as far as the Bronx. Under low flow conditions, vertical mixing of salt water and freshwater is high, with only a 10 percent difference between surface and bottom water salinity. This differential may be as high as 20 percent under high flow conditions (Limburg and Moran 1986).

The most temporally extensive source of water temperature data is from the Poughkeepsie Water Works (PWW) located just north of the city of Poughkeepsie, New York (river mile 76). A summary of the PWW data from 1974 through May 8, 2008 is provided in Figure 6-6.

Adequate dissolved oxygen levels are critical to the survival of fish and other aquatic organisms. Dissolved oxygen concentrations are determined by several factors, including the degree of tidal mixing, photosynthesis rates, temperature, microbial decomposition of organic matter, and organism respiration levels. Photosynthesis, a high degree of tidal mixing, and relatively low temperatures generally result in an increase in dissolved oxygen concentrations, while higher organism respiration rates, microbial decomposition of organic material, chemical oxidation, and high air and water temperatures generally depress dissolved oxygen levels. Seasonal variation in dissolved oxygen levels in the section of the Hudson River between Catskill and Albany typically range from high dissolved oxygen concentrations in the spring (generally between 10.0 and 12.0 parts per million (ppm) to lowest dissolved oxygen concentrations in the summer (generally between 7.0 and 8.0 ppm), while dissolved oxygen concentrations during the fall range between (8.0 and 12.0 ppm) (Dynegy 2006).

pH is a measure of hydrogen ion concentration and is an important biological parameter. Aquatic organisms in the Hudson River generally have a high tolerance to naturally occurring pH ranges between 6.4 and 8.2 (Cooper et al. 1988). The regional pH for the Hudson between Catskill and Albany (river mile 112 to 150) has historically averaged 7.0.

Haverstraw Bay, the widest portion of the Hudson River is the northern reach of what is generally regarded as the "lower Hudson River," and as such, exhibits estuarine habitat characteristics, with a strong semi-diurnal tide, and seasonally variable salinities that generally remain below 10 ppt. The bay extends approximately six miles from Stony Point to Croton Point, in the Towns of Stony Point, Haverstraw, and Clarkstown, in Rockland County; and the Town of Cortlandt, in Westchester County. Haverstraw Bay is avoided by the route with an overland bypass located primarily along the CSX railroad.

Tidal mixing of riverine and oceanic water is maximized in Haverstraw Bay, and the presence of the "salt front" promotes trapping of nutrients and plankton. Turbidity is relatively high in this portion of the Hudson River Estuary; however, extensive beds of SAV occur in tidal shallows along the bay shores.

In 2000 and 2001, NYSDEC conducted the Hudson River Biocriteria Project to develop indicators of biological conditions for the Hudson River Estuary. The goal of the project was to develop one or more biological indicators that could be used to assess the ecological condition of the estuary through long-term monitoring. Water samples were collected for nutrient analysis and TSS using a peristaltic pump or a Nisken bottle lowered to approximately one meter from the bottom. In addition, *in situ* water column profiles were performed at each station to measure the basic water quality parameters of dissolved oxygen, salinity, conductivity, temperature, and turbidity. Water clarity was measured with a Secchi disk (Llanso et al. 2003).

Sampling sites in the Hudson River (Troy to The Battery) had mean and median water depths between 8 and 9 meters, a maximum of 40.5 meters, and a minimum of 0.6 meters, reflecting a wide range of sampling depths. Mean bottom dissolved oxygen (8.6 to 8.8 mg/l) and temperature (19.4 to 21.7°C) were typical of late summer conditions of well-mixed temperate systems. The surface-to-bottom stratification of the water column was insignificant. Tidal flow in the Hudson River keeps the water column well mixed vertically (Strayer and Smith 2000); therefore low dissolved oxygen was not a problem (Llanso et al. 2003).

Salinities throughout the oligohaline and mesohaline portions of the estuary were lower in 2000 than in 2001. In September 2000, mean bottom salinities were 10.9 practical salinity units (psu) (range 8 to 13) between river miles 15 to 21, and 3.8 psu (range 1 to 12) between river miles 22-43, with most measurements in this last transitional zone below 5.0 psu. In September 2001, mean bottom salinities over the same river mile zones were 13.4 psu (range 8 to 16) and 8.4 psu (range 6 to 12), respectively. Lower salinities in 2000 were probably caused by high water flows. Turbidity was generally low in both years except for higher readings (40 to 176 nephelometric turbidity units [NTU]) at many of the mesohaline sites below river mile 24, at one site in Stony Point Bay south of Peekskill (316 NTU), and at 11 sites in the Newburgh area between river mile 58 and 66 (50 to 562 NTU).

Water quality parameter concentrations, summarized in Table 6-7, generally appeared to be typical of what would be expected in large tidal estuaries. Nitrate (the predominant form in the analysis of nitrate-nitrite) was predominately detected in the lower portion of the estuary, from Newburgh to the river mouth. Nitrate concentrations increased with the salinity gradient. Likewise, nitrite and total Kjeldhal nitrogen (TKN) were largely undetected in the upper estuary but measured in the mesohaline zone. Orthophosphate and total phosphate were detected at most sites in keeping with their non-limiting role in estuaries. Nutrient concentrations were high at many sites in the vicinity of Nyack and Yonkers, possibly indicating pollution sources in this region. Highest concentrations for nitrate (0.7 to 0.9 mg/l), and total phosphate (0.25 to 0.96 mg/l) occurred at sites near Nyack and Yonkers. Most nitrite (0.05 to 0.15 mg/l) and TKN (1.5 to 6.2 mg/l) detections occurred in the lower portion of the estuary, from Yonkers to the river mouth, and orthophosphate concentrations were highest (0.15 to 0.18 mg/l) at Yonkers and along Manhattan. Water column ammonia was detected at eight sites in concentrations ranging from 0.2 to 3.8 mg/l. TSS were highest (110 to 520 mg/l) at 12 sites in Yonkers, two in Poughkeepsie, one each in Newburgh and Kingston, and two additional sites further upstream (Llanso et al. 2003).

6.1.2.1 Water Quality Modeling

In October of 2010, the Applicants developed a report describing the development and application of a three-dimensional hydrodynamic and time-variable water quality model to assess water quality impacts and compliance with water quality standards in the Hudson, Harlem and East Rivers (see Joint Proposal Exhibit 85). As it is anticipated that the vast majority of the cable will be installed using water jetting, the model inputs were based on the use of this technology. The model assumed that work would be conducted in two stages, from Coeymans, New York to Haverstraw, New York and from Haverstraw, New York to Astoria, New York. From Coeymans to Haverstraw, the model modeled arsenic, cadmium, mercury, benz(a)anthracene, pyrene, 4,4-DDE, copper, lead, phenanthrene and PCB. In the lower Hudson River and Harlem River, the selected contaminants were 4,4-DDE, copper, lead, phenanthrene, PCB, naphthalene, fluorine, nickel, dioxin, and acenaphthene.

The model computed that there would be no exceedances of the water quality standards that are based on protecting aquatic life from acute toxicity. The acute toxicity standard is the most appropriate criteria for the assessment of the proposed HVDC Transmission System, given the non-chronic (i.e., short-term) and incremental nature of the potential exposure to sediment contaminants resulting from the cable installation. For some contaminants, such as PCBs and 4,4’-DDE, there is no acute standard. However, the projected maximum total PCB concentration is below the EPA’s Engineering Performance Standard water quality criteria for dredging resuspension at the Hudson River PCBs Superfund Site (EPA 2003). And the 4,4’-DDE concentrations reported are well below the DDE acute toxicity standard 1,050 ug/L adopted by Nebraska (2009).

6.1.3 Harlem River and East River

After leaving the Hudson River, the next segment of the proposed transmission cable route turns east through the Harlem River and, after an overland segment, through the East River for a short distance.

NYSDEC surface water quality classifications for the Harlem River and East River are Class I. The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. Dissolved oxygen for Class I waters should not be less than 4.0 mg/l at any time. The Harlem River and East River are on NYSDEC's list of impaired waterbodies, known as the 303(d) list (NYSDEC 2008b). The causes of the impairment are PCBs and other toxins.

The City of New York annually collects water quality data in the waters surrounding the five boroughs, to allow for assessments of trends and improvements in the water quality of New York Harbor (NYCDEP 2008). Measurements are collected at near-surface and near-bottom for a set of stations on a weekly or biweekly basis. Water quality data collected in recent decades for key constituents are summarized in Table 6-8. Five major indicators of water quality are used to assess the state of water quality in the harbor: dissolved oxygen, TSS, Secchi transparency, chlorophyll-a, and fecal coliform. The trends from the 2008 data and earlier described below represent averages of all stations in this region, including stations in Flushing Bay and Western Long Island Sound that are not adjacent to the underwater transmission cable route (Figure 6-7).

For the inner harbor area (which includes the section of the Hudson from the New York City-Westchester County boundary to the Harlem River confluence - Figure 6-8), fecal coliform, an indicator of sewage-related pollution, showed low averages that met the monthly geometric mean criterion of 200 counts/100 milliliters (ml) for Class SB. However, episodes of combined sewer and stormwater overflows can cause exceedance s and beach closings. Fecal coliform concentrations have been on the decline since the 1970s (NYCDEP 2008). In 2008, summer dissolved oxygen values averaged 7.4 mg/l and bottom values averaged 6.6 mg/l, well above the New York State Class SB criterion of 5 mg/l and the State Class I criterion of 4 mg/l. These dissolved oxygen standards have been met since the late 1980s. Chlorophyll-a averaged 7.2 micrograms per liter (µg/l) in 2008, with a focal point being the Gowanus Canal which had monthly summer averages of approximately 20 µg/l. Long-term chlorophyll concentrations are generally stable.

Secchi depth an indicator of water clarity, averaged 4.9 feet from 1986-2008 (Table 6-8). Average summer values have remained fairly constant in the inner harbor since measurement began in 1986. These values represent averages of all stations in the inner harbor area, including upper New York Bay and the lower East River. The lowest values of Secchi depth generally occur in Flushing Creek and the Harlem River which transport substantial solids during wet weather periods. The highest Secchi depth readings generally occur along or near the centerline of the upper East River and Long Island Sound. Since 1986, Secchi depth has varied between 3.9 and 5.9 feet.

6.2 Bathymetry

Bathymetry is an important factor to consider during underwater cable laying and burial. Steep or abrupt submarine bathymetry can exacerbate cable installation issues and engineering costs. In addition, extreme changes in bathymetry can affect underwater cable design and life-span performance. Information regarding bathymetry found along the proposed route was obtained and compiled from the National Oceanic and Atmospheric Administration (NOAA) Navigational Charts for Lake Champlain, the Hudson River, the Harlem River and East River.

The bathymetry of the study area comprises a wide range of lacustrine, riverine, and marine environments. Sediment composition and geologic characteristics are foremost in having shaped bathymetric contours over time.

6.2.1 Lake Champlain

As the proposed transmission cable corridor crosses the United States/Canadian border, it enters into Lake Champlain from the Richelieu River and travels south passing to the west of Isle La Motte. Water depths along the route range from approximately 12 to 50 feet, and the cable corridor takes advantage of gradual changes in water depth. As the cable corridor approaches the south end of Isle La Motte, the corridor becomes constrained to the middle and eastern shore of Lake Champlain in order to avoid Schuyler Reef, Valcour and Schuyler Islands, and areas with steep changes in bathymetry near plateaus, rises, troughs, and basins.

Continuing south of Isle La Motte, the proposed transmission cable corridor follows the 100- and 150-foot depth contours on the west side of Grand Isle, which avoids Providence and Stave Islands, and continues in water depths between 50 and 150 feet, passing Juniper Ridge and Juniper Trough. In this area, the width of the proposed transmission cable corridor is limited in order to avoid the changes in bathymetry due to the presence of the ridge and trough. At the southern end of Baldwin Deep, the proposed transmission cable corridor is constrained in width by Thompson Point to the east and Split Rock Point to the west. Water depths in this area range from 200 to 350 feet. The cable corridor continues in these water depths until the northern portion of Folger Trough, and then takes advantage of the shallow water depths ranging from 12 to 50 feet from Basin Harbor through South Lake. From Putnam Station, New York to the beginning of the Champlain Canal at the Elbow in Whitehall, New York, water depths range from 12 to 20 feet.

The waters of Lake Champlain reach their greatest depth, over 400 feet, in the area between Charlotte, Vermont and Essex, New York. The average depth of the Lake is only 64 feet and some parts of the Lake are very shallow. However, water depths along the underwater transmission cable route vary from 10 feet to approximately 300 feet. Throughout Lake Champlain there are basins, troughs, and plateaus. In addition, the cable route was sited to avoid steep changes in slope, to the extent possible.

Rocky shorelines and reefs are found around the islands in Lake Champlain. The Chazy Reef is located on Isla La Motte. The cable route has been sited around reefs and rocky outcrops in Lake Champlain.

6.2.2 Hudson River

Hudson River water depths along the cable route vary. In general, water depths range from approximately 7 feet near shore to 116 feet in the channel throughout this portion of the underwater transmission cable route. The median depth is approximately 50 feet. The upper-estuary from Poughkeepsie north to the Troy Dam constitutes the majority of the tidal freshwater river. In general, the natural depths are greatest in the southern portion of this area, with depths decreasing towards the northern end of the estuary. A shipping channel is maintained to 32 feet MLW by dredging as far north as the port of Albany, and to 15 feet MLW from Albany to the Troy Dam. Historically, the upper part of the river from the Troy Dam south to the City of Hudson was a network of shoals, islands, and channels.

The mid-estuary begins north of Haverstraw and Tappan Zee Bays at the Town of Stony Point (river mile 40). North of the City of Peekskill at river mile 44, the river passes into the Hudson Highlands where it narrows to an average width of about 1,800 feet. The Hudson Highlands area of the river is a deep (49 to 197 feet) and turbulent mixing zone with little shoal area and steep rocky shorelines. Moving upstream beyond the Hudson Highlands into the Town of Cornwall at river mile 56, the Hudson River widens to an average width of 5,800 feet in an area called Newburgh Bay. The average mid-channel depth of Newburgh Bay is about 40 feet. There are wider shoal areas along the shoreline, especially on the eastern shore, supporting growth of SAV. North of the Village of Wappingers Falls (river mile 67), the river narrows again and increases in depth to as much as 125 feet (USFWS 1997).

There are two distinct sections of the river within the lower estuary. The first, from the Battery at river mile 0 to the New York-New Jersey state line at river mile 22, is fairly narrow, with an average width of about 5,000 feet, an average depth of about 40 feet. There is only a narrow band of shallow subtidal flats along the shoreline. The northern section of the lower estuary area from the state line north to Stony Point, river mile 22 to about river mile 41, includes the Tappan Zee, and Haverstraw and Croton Bays, and is known as the wide bays region. In this section, the river is much wider (to 3.5 miles wide) and shallower (6 to 12 feet), except for the 40 foot deep channel. In Haverstraw Bay the channel is maintained by dredging at a depth of 9.8 meters (32 feet).

6.2.3 Harlem River and East River

Water depths range from approximately 14 to 27 feet along the portion of the proposed transmission cable route within the Harlem River extending from the Hudson River confluence to the Hell Gate Bypass. The proposed transmission cable route in the East River is located in water depths ranging from 10 to 70 feet.

6.3 Sediment Physical and Chemical Characteristics

A review of existing information regarding sediment type, sediment quality, and sediment contaminant sources in the vicinity of the proposed underwater transmission cable route was conducted for the proposed HVDC Transmission System (Table 6-9, Table 6-10). Maps of historic sampling locations can be found in Appendix D of the Application (Exhibit 18 of the Joint Proposal).

Most historic sampling programs analyzed chemical constituents covering a broad spatial and temporal scale using cores and/or sediment grabs. Concentrations of contaminants found in the sediment can be compared against the effects range-median (ER-M) concentration, which corresponds to the median (50th percentile) concentrations associated with adverse biological effects. Alternatively, effects range-low (ER-L) concentrations have a 10 percent probability (10th percentile) of inducing adverse biological effects. Generally speaking, ER-M concentrations cause observable adverse effects in organisms and biological communities, while ER-L concentrations are those where biological effects begin to be observed. The ER-L and ER-M concentration standards for common analytes are shown in Table 6-11.

6.3.1 Lake Champlain

Lake Champlain's sediment composition has been studied and documented by the Lake Champlain Basin Program (LCBP), a partnership among multiple federal and state agencies within New York and Vermont. In general, Lake Champlain sediment types vary from dark gray mud (i.e., silt, clay, and organic material) to diatomaceous muds and clays (LCRC 2004). Due to changes in bathymetry, shifts in sediment type (i.e., sand to rock) are common, especially in near-shore zones and around islands. In the near-shore zone, bottom sediments may consist of mud and a higher content of debris and organic matter.

Sediment type tends to vary with water depth throughout the Lake. Surficial sediments range from muds to silt and clay with patches of sand and gravel. In the northern portion of the lake, as part of the NYSDEC RIBS, sampling at a Richelieu River station found the sediment to be predominantly silt and clays, with 96 percent less than 0.0625 mm diameter (LCBP 2009a).

Recent bottom surveys have identified sedimentary slumps near Diamond Island and Whallon's Bay in Lake Champlain. Slumps are a form of a mass wasting event that occurs when loosely consolidated materials or rock layers move a short distance down a slope. These slumps vary in size from 55 yards wide by 110 yards long by 20 yards thick, to 440 yards wide by 600 yards long by 20 yards thick, respectively. They are found in depths of approximately 130 feet (Manley and Manley 2009). Although the proposed transmission cable corridor avoids these slumps, there may be other slumps within Lake Champlain that have not yet been identified.

The Lake Champlain Sediment Toxics Assessment Program has documented contaminant levels within sediments on the lake bottom (LCBP 2009b). Initial surveys in 1991 collected samples from 30 sites throughout the lake and analyzed them for common contaminants such as trace elements, PCBs, chlorinated hydrocarbon pesticides (dichloro-diphenyl-trichloroethane [DDT], etc.), and PAHs. The surveys identified the presence of contaminants in sediment, water, and biota at elevated levels (LCBP 2009b). The program prioritized PCBs and mercury as persistent contaminants found lakewide and arsenic, cadmium, chromium dioxins/furans, lead nickel, PAHs, silver zinc, copper, and persistent chlorinated pesticides as persistent contaminants in localized areas. The program also identified three locations for more intensive surveys and clean-up actions: Outer Malletts Bay, Inner Burlington Harbor, and Cumberland Bay.

Contaminants of concern identified within Cumberland Bay were PCBs, PAHs, copper, and zinc (LCBP 2009b). Since remediation of Wilcox Dock in Cumberland Bay by the NYSDEC in 2001, subsequent monitoring has indicated a significant decline in PCBs in both sediment and water (LCBP 2009b). Restoration activities included the removal of contaminated sediment and the restoration of affected wetlands and shoreline areas.

An assessment of mercury sources to Lake Champlain was conducted in 2006 by the Ecosystems Research Group of Norwich, Vermont, Dartmouth College, United States Geological Service, and the Vermont Agency of Natural Resources. This study found that 59 percent of mercury enters the Lake from the surrounding watershed, with atmospheric deposition accounting for 40 percent, and 1 percent from wastewater treatment effluent discharged directly to the Lake (VTDEC 2009).

6.3.2 Hudson River

The Hudson River Benthic Mapping Project, funded by the NYSDEC, produced a comprehensive data set consisting of high-resolution multi-beam bathymetry, side-scan sonar, and sub-bottom data, as well as over 400 sediment cores and 600 grab samples. Overall, the benthic mapping project identified regional sediment distributions within the Hudson River, although within each region there are small-scale variations in sediment distribution which can actually determine the sediment type encountered (Bell et al. 2006 and Nitsche et al. 2007). Based on the results of the Benthic Mapping Project, the distribution of sediment texture throughout the Hudson can be divided into eight sections with unique sediment characteristics:

1. Albany/Troy - artificial straightened, gravel and sand;
2. Catskill - fluvial influenced, sand and muddy sand;
3. Poughkeepsie - bedrock bound, sandstone and shale;
4. Newburgh Bay - tide dominated, mud;
5. Hudson Highland Gorge - bedrock bound, muddy sediments;
6. Tappan Zee/Haverstraw Bay - tide dominated, muddy sediments with sand and gravel in the main channel;
7. Palisades - bedrock bound, muddy; and
8. Upper Bay - tide dominated; sand with large variations in grain size.

In addition to these large-scale characteristics, local variations are significant determinants in benthic habitats and contaminant distribution. The leading determinants of local sediment variation are:

1. Local bedrock morphology, including peninsulas and islands that modify the river flow through the processes of scour and erosion;

2. Tributary input, which sometimes results in local gravel and sand deposits near tributary mouths, such as Twaalfskill Creek and the Harlem River;
3. Local hydrodynamics, including effects from tidal ebb and flood current asymmetries; and
4. Human impact, including dredging, dredge spoil, bridges, and piers.

As part of the NYSDEC Biocriteria Project, sediment samples were collected from the Troy Dam to the Battery (i.e., southern tip of Manhattan) (Llanso et al. 2003). Sediment samples were collected with a Young grab, which samples a surface area of 0.044 m^2 to a depth in the sediment of 10 centimeters (cm). Three samples were collected at each site. The first sample was processed for benthos and the other two samples were used for sediment chemistry. Grabs with shallow penetration (< 7 cm) were used for sediment chemistry only.

Sediments were mostly muds (median = 73 percent silt-clay) with concentrations of organic matter that were greater than 2 percent for most sites in 2000 (range 0.1 to 7.9 percent), but less than 2 percent for all sites sampled in 2001. Muddy substrates predominated in the lower portion of the estuary below Kingston. Sandy (< 10 percent silt-clay) and mixed substrates predominated in the upper portion of the estuary, between Kingston and Troy.

Sediment samples were also collected for the Contamination and Assessment Reduction Project (CARP), which was a collaborative effort between state, Federal, and non-governmental organizations (NGOs) to develop sediment fate and transport models within the New York/New Jersey Harbor (HydroQual 2007). Sediments were collected to characterize sediment type and quality. CARP results indicate that the sediment in the Hudson River appears to become progressively dominated by silts and clays from Alsen to New York City. In Alsen, New York, 72 percent of the sediment sample was sand and the rest clay and gravel. Near Ossining, New York, sediment shifts towards being clay/silt dominated (clay 40 percent silt 37 percent, sand 20 percent, gravel 3 percent). Near Piermont, New York, over 90 percent of the sediment sample was comprised of clay (40 percent) and silt (53 percent). North of the George Washington Bridge, fines represented 97 percent of the sediment sample.

The proposed transmission cable corridor traverses the mud-dominated central section and fluvial sand-dominated sediments in the freshwater section of the Hudson River Estuary. As the proposed transmission cable route continues south of Coeymans, New York, the dominant sediment type in the Hudson River is gravel and glacial sand within the channel, which shifts to silt and sand as the corridor approaches Coxsackie, New York (Bell et al. 2006 and Nitsche et al. 2007).

From Coxsackie south toward Newburgh, New York, the river is characterized by shoals, sandbars, sediment waves, and scoured areas where tributaries enter the Hudson River. The dominant sediment type within this portion of the proposed transmission cable route is mud and sand (Bell et al. 2006). The corridor will avoid depositional areas near tributary mouths, as debris could impact cable installation. From Newburgh, New York to the Harlem River, the predominant sediment types are mud and sand.

The Hudson River PCBs Site (USEPA Identification Number NYD980763841) includes a 200 river mile stretch of the Hudson River from the Village of Hudson Falls to the Battery in New York City. The site is divided into the upper Hudson River (the length of the river between Hudson Falls and the Federal Dam at Troy) and the lower Hudson River (the length of the river between the Federal Dam at Troy and the Battery). The upper Hudson River region includes areas that have been and may continue to be sources of PCB contamination to the river, including General Electric Company's Hudson Falls and Fort Edward plants, which discharged PCB contaminated liquids, used as an insulating fluid in the manufacture of electrical capacitors, into the Hudson River. This material accumulated behind the dam in Fort Edward until the dam was demolished in 1973, resulting in the material settling in river sediments up to 200 miles away. In addition, five remnant deposits of PCB-contaminated soils were exposed after the river water level dropped following removal of the Fort Edward Dam.

A Record of Decision (ROD) by the USEPA in 1984 presented a remedy that included in-place containment of the remnant deposits and an interim "No Action" with regard to the PCB-contaminated river sediment. In 1989, the USEPA announced its decision to reassess this strategy, and a ROD issued in 2002 selected the dredging of approximately 2.65 million cubic yards of PCB-contaminated sediment from the upper Hudson River, including approximately 341,000 cubic yards from the Champlain Canal (in river portion). The USEPA concluded that the contaminated sediments in the upper river are a major source of PCBs to the entire river environment. Much of the area directly affected by the PCB contamination and that is currently undergoing a dredging cleanup operation will be avoided through an underground transmission cable route bypass.

PCBs are not the only contaminant of concern in the Hudson River Estuary. High concentrations of DDT have been identified in some Hudson River tributaries. The sources of this harmful pesticide are difficult to pinpoint, but may be related to old agricultural practices. Airborne mercury, a byproduct of coal combustion, is deposited along the estuary and can accumulate to harmful levels in fish and other aquatic biota.

Cadmium is another contaminant of concern in the Hudson River Estuary. During 1952-1979, a nickel-cadmium battery manufacturing facility located in Cold Spring, New York, discharged over 179,000 kilogram (kg) of cadmium-enriched waste into Foundry Cove, a freshwater intertidal wetland. This site was considered the most heavily cadmium-polluted location in the world, with sediment cadmium concentrations of 500 to 225,000 ppm (Knutson et al. 1987). Foundry Cove was designated a Super Fund site by the USEPA in 1983. A $91 million sediment remediation and habitat restoration project was conducted at the site in 1994. Following completion of the remediation/restoration project, sediment cadmium concentrations ranged from 10 to 100 ppm (Junkins and Levinton 2003).

Treated sewage effluent is discharged into many Hudson River tributaries by towns and villages. Many older municipalities have aging sewage treatment systems with clay pipes, along with inadequate pump stations and treatment plants. This decaying infrastructure permits raw sewage to enter the estuary under conditions of heavy rainfall (Cooper et al. 1988). In the lower estuary, CSOs discharge during storm events, contributing a pulse of nutrients and other contaminants.

Based on Llanso et al. 2003 study, sediment ammonia concentrations were generally low (Table 6-12), with higher concentrations (50-150 milligrams per kilogram [mg/kg]) at five sites near Yonkers (river mile 15-20), six sites in the Newburgh region (river mile 57-70), and six additional sites upstream. In addition, samples were analyzed for metals, PAHs, PCBs, pesticides, TOC, volatile solids, percent silt-clay, and ammonia (Table 6-12). Concentrations were highest for mercury and silver, which were found to be most often in excess of ERM values. Both metal and PAH contamination occurred throughout the river, but PAHs were most prevalent at sites in Yonkers, Newburgh Bay, Poughkeepsie, and Kingston. PAH concentrations were mostly below ERM concentrations, and often below the ERL value. PCBs were present at 71 sites at concentrations that exceeded the ERL value. Fifteen of these sites had high concentrations in excess of the ERM value. High PCB sites were generally scattered throughout the river, but some were concentrated in the Yonkers region. Pesticides were largely undetected and present only at two sites north of Poughkeepsie at concentrations that exceeded the ERM value (Llanso et al. 2003).

Sediment cores were taken in the lower Hudson River as part of efforts to develop sediment fate and transport models within the New York/New Jersey Harbor (HydroQual 2007). During 1999 and 2001, 15 surficial sediment grabs of the top 10 cm were taken at the following stations (from north to south) in this section of the Hudson River and analyzed for contaminants:

- Alsen, New York (just south of the Rip Van Winkle Bridge);
- Ossining, New York;
- Piermont, New York; and
- New York City, north of the George Washington Bridge at the mouth of the Harlem River (11 samples taken).

In Alsen, New York, the CARP sampling data detected concentrations of dioxin and furans at concentrations of less than 0.2 parts per billion (ppb). A few metals were detected at levels that did not exceed the ER-L. Pesticides were identified, including dichloro-diphenyl-dichloroethylene (DDE), dichloro-diphenyl-dichloroethane (DDD), DDT, chlordane, dieldrin, and endrin, with some levels exceeding the ER-L but none exceeding the ER-M. Seventeen (17) PAHs were detected, all of which were below 100 ppb and none exceeding their ER-L values. For PCBs, 165 of the 209 congeners were recovered and total PCB concentration was 626 ppb.

In Ossining, New York, dioxin and furan compounds were detected, but all at levels less than 1 ppb. Metals, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc, were detected. No metals reported concentrations above the ER-M, and only copper, lead, mercury, and zinc were above the ER-L values. Pesticides were reported, including DDE, DDD, DDT, chlordane, dieldrin, and endrin, with most exceeding the ER-L but none exceeding the ER-M. PAHs results were similar to those reported at the Alsen Station, although with slightly higher concentrations. For PCBs, 165 of the 209 congeners were recovered, and total PCB concentration was 836 ppb.

In Piermont, New York, dioxin and furan compounds were detected at levels less than 1 ppb in most cases. Metals were also detected, with mercury nearing the ER-M and arsenic, copper, lead, nickel and zinc exceeding the ER-L. Pesticides including DDE, DDD, DDT, chlordane, dieldrin, and endrin were reported at higher concentrations than the upstream stations, all of which exceeded the ER-L but not the ER-M. Twenty-one (21) PAHs were detected, many with concentrations between 100-300 ppb, and only fluorine exceeded the ER-L values. The total concentration of all 165 PCB congeners reported was 1,069 ppb.

At the site in the Hudson River north of the George Washington Bridge, dioxins and furans were recovered at concentrations greater than 1 ppb. Arsenic, cadmium, chromium, copper, lead, nickel, and zinc were recovered at concentrations greater than the ER-L and in most samples, mercury and silver exceeded the ER-M value. Most of the pesticides detected consistently exceeded the ER-L, but only total DDT exceeded the ER-M values. Many of the PAHs detected had concentrations between 100-400 ppb and several exceeded the ER-L values. Total PCBs had a concentration of 4,577 ppb, significantly higher than the other stations sampled in the Hudson River as part of the CARP.

6.3.3 Harlem River and East River

The Harlem River is scoured daily by tidal action, and sediments tend to be a mixture of sand, gravel, and cobble. Near the confluence with the East River, the Harlem River has soft bottom substrate, with frequent shoals along the banks. Due to swift currents and blasting to create the navigation channel, areas of the East River have exposed bedrock and coarser substrates. Cable installation in the East River may require use of alternate burial techniques, such as the use of concrete mattresses or rip rap over the cables.

Existing sediment quality information for the Harlem and East Rivers was obtained from the USACE study area reports, USFWS, and from the CARP dataset. Within New York City, there are four primary contaminants of concern: mercury, PCBs, dioxin, and DDT (pesticide). In and around New York City, the major sources of contaminated sediments include industrial discharges, wastewater treatment plant discharges, CSOs, stormwater runoff, non-point source discharges, atmospheric deposition, and chemical and oil spills (USFWS 1997). The Harlem and East Rivers are urban mixed with residential, commercial, and industrial development, and have degraded sediment quality due to the point sources located along the shorelines, particularly the many CSO outfalls.

Sediment samples were collected from the East River by the USEPA Regional Environmental Monitoring and Assessment Program (REMAP) sampling during 1993-1994 and 1998 (as cited in Steinberg et al. 2004), and from the Harlem and East Rivers through the CARP during 2000. Through the CARP program, 14 sediment samples were collected and analyzed from the Harlem River and 14 sediment samples collected from the East River (Appendix D of the Application; Exhibit 18 of the Joint Proposal).

In the Harlem River, dioxin and furan compounds were detected, in most cases at levels less than 1 ppb. At most sample locations, metals were also detected, with arsenic, cadmium, chromium, copper, lead, nickel, and zinc exceeding the ER-L but not the ER-M. However, in two samples collected at Spuyten Duyvil and Willis Avenue Bridge, lead exceeded the ER-M. All of the samples collected exceeded the mercury ER-M. Five samples exceeded the ER-M for silver, four at Spuyten Duyvil and one at the Willis Avenue Bridge, and all samples exceeded the ER-L.

Pesticides were reported at levels that generally exceeded the corresponding ER-L values, but chlordane (two samples), dieldrin (one sample) and Total DDT (nine samples) exceeded established ER-M concentrations. PAHs were found in concentrations mostly between 100-2,400 ppb, with one station exceeding the ER-L values. The total concentration of PCB congeners detected ranged from 455 ppb near the 207th Street Bridge to 5,408 ppb at Sputen Duyvil.

In the East River, dioxin and furan compounds were found at levels below 1 ppb. Metals were also detected, with levels that exceeded the ER-L in the majority of samples. Cadmium levels for four samples collected near Riker's Island had concentrations that exceeded the ER-M. Copper concentrations exceeded the ER-M in four samples at Riker's Island and one near Ward's Island, with levels in the remaining samples exceeding the ER-L. Lead concentrations exceeded the ER-M at nine samples near Riker's and Ward's islands. For all samples, mercury and silver levels exceeded their respective ER-M levels. Five samples exceeded the nickel ER-M and five samples exceeded zinc ER-M value, with the remaining samples all exceeding the ER-L concentrations for these two metals. Pesticides were generally reported at levels about the established ER-L values, with a higher occurrence of exceedance s of ER-M concentrations than was reported in the Harlem River. PAHs were detected at concentrations of 100-6,400 ppb, often exceeding ER-M values. The total concentration of PCB congeners detected ranged from 726 ppb near the Bronx River to 5,107 ppb near Riker's Island.

6.4 Marine Disposal Areas, Dumping Grounds, Disposal Sites, and Spoil Areas

The USACE designates disposal and spoil areas for dumping this dredged material. Disposal areas are established where existing depths indicate that the deposition of dredged materials are not likely to cause shoaling sufficient to create a danger to surface navigation (NOAA 2009a,b). Disposal areas are charted, and soundings and depth curves are retained. Spoil areas are usually near and parallel to dredged channels, and are typically a hazard to navigation, even for shallow-draft vessels. Spoil areas are charted, although soundings and depth curves are omitted (NOAA 2009a, b).

Code of Federal Regulations (33 CFR § 205) previously established marine dumping grounds in waters of the United States. These regulations were subsequently revoked, and the use of designated dumping grounds has been discontinued. These areas are no longer considered to be a danger to navigation.

The United States Coast Pilot (NOAA 2009 a, b) categorizes disposal areas, dumping grounds, disposal sites, and spoil areas as artificial obstruction to navigation. These areas are described below according to their proximity to municipalities and geographic features, as applicable.

6.4.1 Lake Champlain

Fort Montgomery. A spoil area is located north of the Village of Rouses Point, New York. The spoil area is situated along the western shoreline of Lake Champlain, near Fort Montgomery.

6.4.2 Hudson River

Green Flats. In the Green Flats section of the river, the transmission line will pass near a disposal area along the left shoreline near the Hamlet of Malden on Hudson.

Riverdale. A dumping ground is located along the left shoreline of the Hudson River near the Riverdale section of the Bronx.

6.5 Avoidance and/or Minimization of Potential Impacts

The underwater transmission cable route will be aligned to avoid disposal areas, dumping grounds, and spoil areas. Therefore, the HVDC Transmission System is not expected to have any impact on these areas. In general, potential impacts to water quality along the underwater transmission cable route will be closely associated with sediment type and sediment contaminants. Re-suspension may cause contaminants adsorbed to sediment particles to disassociate, thereby becoming more readily available in the water column and to aquatic organisms. Due to the varied sediment characteristics and quality along the underwater transmission cable route, potential water quality impacts due to re-suspension of sediments and contaminant will be dependent on local sediment characteristics. The underwater route was sited to avoid areas of higher contamination concentrations (i.e., Upper Hudson River PCB Dredging Project). No permanent or long-term impacts on water quality from cable installation are expected. In addition, no potential subsequent impacts will occur during cable operation unless cable repair is required.

In the sections of the underwater transmission cable route that are either riverine or tidal (Hudson River, Harlem River, and East River), the existing water quality typically experiences periods of naturally occurring increases in suspended sediments (i.e., storm events). In general, no long-term or permanent impacts to sediment characteristics, sediment quality, bathymetry, or water quality are expected during the cable installation and impacts are not anticipated during cable operation. Water quality modeling reported that there would be no exceedance of water quality standards that are based on protecting aquatic life from acute toxicity.

Once the cable is buried the bathymetry will return to pre-installation conditions through redeposition of the disturbed material into the trench. Even in cases where less than 100 percent of the disturbed sediment settles in the trench, the hydrodynamic regime at any given location along the underwater transmission cable route will not be changed so it can be expected that in time natural sedimentation will complete the refilling of the trench. Where bottom conditions do not permit burial in the substrate, the cable will be laid on the bottom and protected by laying concrete mats or rip-rap over the cables for protection. The mats will alter local hydraulic conditions such that some sediment deposition or scouring may occur around the irregularity in the bottom formed by the mats. However, the overall change in bottom topography will be insignificant because the mats will extend only a short height above the bottom and functional benthic habitat will develop. The volume of the cable is extremely small relative to the sediment layer and bottom hydrography of the water bodies involved, and the effect of the cable on bathymetry will be insignificant relative to natural levels of fluctuation due to currents, storms, navigational traffic, and other pre-existing factors.

6.5.1 Potential Impact Assessment

The potential impacts of each installation technique are discussed below.

6.5.1.1 Jet Plow / Water Jetting

The sediment will be fluidized to a trench depth of approximately 7 feet or more in a linear path approximately 2 feet wide, with an additional surface disturbance of two 3-foot wide water jetting device skids, wheels, or support frame. During water jetting, any potential impacts from sediment re-suspension will be localized and limited to the area around the water jetting device. Sediment re-suspension will depend on sediment density, size and shape, as well as the hydrodynamic forces of the surrounding water. Dispersion of sediments during cable installation will be influenced by horizontal advection, dominated by local tidal currents in the Hudson, Harlem, and East Rivers and settling rates. In general, coarse sediment particles, such as sand, settle more readily than finer sediments, such as silts and clays, so only the finest-grained sediments persist in the water column in areas of the lowest current velocity or turbulence. Because the underwater cable route has been selected to be preferentially located in areas with high sand content sediments, sediments re-suspended during cable installation are expected to settle quickly. Potential increases in turbidity and suspended sediment concentrations will therefore be insignificant and comparable to increases associated with natural processes (e.g., wind, waves).

Any contaminants potentially adsorbed to sediments will either resettle in the trench or in adjacent areas, thus the aquatic organisms will be exposed to similar levels of contaminants in sediments as before the installation process. Many contaminants have an affinity for silt, clay, and organics within the sediments, and will become re-adsorbed quickly, settling out along with these sediment particles.

Based on the sediment data collected in the Spring 2010 Marine Route Survey (Supplement, Attachment E; Joint Proposal Exhibit 31), it is not anticipated that a backfill plow will be needed. As the cables will be simultaneously laid and buried, the majority of sediments will refill the trench. In addition, due to the natural dynamic processes in the lakes and rivers, sediments will be naturally deposited within the trench. A post-installation bathymetric survey will be conducted to monitor bottom habitat.

6.5.1.2 Shear Plow Installation

Shear plows can potentially avoid and/or minimize sediment disturbance as they generally require less force to create a narrower trench in the lakebed or seafloor to bury submarine cables than other types of cable installation equipment. The shear plow technology impacts the sediment along a linear trench with the majority of the material falling back into the trench while some material will settle adjacent to the trench on undisturbed substrate. Contaminants, if present, will be redistributed in the near vicinity of the trench, with some surface contaminants becoming buried in the trench.

6.5.1.3 Conventional Dredging

In areas where the cable crosses a navigation channel and at landfall locations, conventional bucket dredging will be used to pre-dredge in order to achieve authorized cable burial depths, remove accumulated sediment in an existing maintained channel, and for HDD exit pits. The dredged material will be placed in scows and either replaced in the trench or pits or removed for placement at a permitted location. Dredging may result in sediment re-suspension as the bucket is brought to the surface. The associated plume will travel varying distances depending upon sediment type and hydrodynamics. Potential impacts will be similar to the deposited sediments suspended by water jetting. The mechanical plow will then install the cables in the pre-dredge area, in which case there will be no additional impact. Placement of imported backfill when dredge spoil is not used will create some additional increases in suspended sediment, the magnitude of which will be dependent on the method of placement and the type of imported backfill used.

6.5.1.4 Concrete Mat / Rip-Rap Protection

In areas where the cable cannot be buried, primarily areas of rocky substrate or at utility crossings, articulated concrete mats or rip-rap will be used to cover the cables to provide protection. The mats or rip-rap will have an insignificant effect on near bottom hydrodynamics, which may be similar to the conditions found in rocky bottom areas. The mats or rip-rap may have a localized impact on hydrodynamic conditions such that some sediment deposition or scour may occur around the irregularity in the bottom formed by the mats or rip-rap.

6.5.1.5 Horizontal Directional Drilling

Potential impacts due to the temporary disturbance of bottom sediments will be further avoided and/or minimized by HDD techniques. As in water jetting, HDD has fewer impacts than conventional dredging and HDD allows avoidance of shoreline trenching. HDD will be used where the cables enter and leave a waterbody to avoid disturbance to the shallow water interface between land and water. A temporary sheetpile cofferdam with an exit pit may be constructed, within which the connection will be made between the buried cables and cables extending offshore through the directionally drilled conduit. The cofferdam would be approximately 16 feet by 30 feet with a dredged entry/exit pit typically 8 feet deep. Driving sheetpile will have an insignificant impact on the substrate and will only create a small amount of suspended sediment. Dewatering and dredging within the cofferdam will remove the substrate along with associated benthic life. The dredged material will be stored in a scow for replacement after the connection is made. The cofferdam will avoid and/or minimize turbidity associated with dredging and subsequent replacement and recontouring of the substrate. Removal of the sheetpiles will create localized turbidity in a very small area.

If a cofferdam is not used at the in-water exit pit, potential impacts during directional drilling will include the release of drilling fluids and sediment disturbance at the exit hole. Additionally, inadvertent release of drilling fluid from the drill hole may occur at the HDD entry and exit location In the case of a release during HDD construction, gelatinous drilling fluid will flow outward from the point of discharge and cover a small area of the bottom. Depending on currents or wave action, some of the deposited drilling fluid could become suspended or dispersed. In the unlikely event of drilling fluid break-through, the bentonite slurry will settle in a cohesive mass that can be removed from the waterbody floor. The potential release of drilling fluid to the waterbody will be avoided and/or minimized through monitoring of drilling fluid volume, development and implementation of a drilling fluid loss response plan, and the use of appropriate bentonite drilling fluids that solidify upon contact with water.

6.5.1.6 Vessel Positioning

While it is anticipated that the majority of the cable installation will be performed using dynamically positioned vessels, certain activities will require anchored, spud moored, or jack-up vessels. Traditionally, conventional dredging is performed from spud barges, and it may be necessary to use these barges to support the work at the HDD exit hole. The size of the spud barge legs will be dependent on the size and type of the barge, but it is anticipated for this work the leg sizes could be from 2’ x 2’ to 5’ x 5’. Jack-up legs are likely to have pads that range in size from approximately 80 to 300 square feet. The contact point on the bottom for the anchor, spudding or jack-up legs would compact the sediments as they sink and cause localized resuspension of sediments as the anchor/legs are lowered and raised. The depth of compaction would depend on the depth and characteristics (grain size, moisture content, etc.) of the sediments. The areas affected by the activities would gradually experience a rebuilding of the characteristic sediment type in the impacted area. The number of areas where this equipment would be used is very limited, thus the overall effects of this construction technique would be insignificant.

6.5.1.7 Cable Repair during Operation

During HVDC Transmission System operation, the only potential impact to water quality and bottom sediments will occur in the event of cable damage. In this instance, a jet plow may be used to expose a length of the cable on either side of the repair location. The cable will then be cut and the ends brought to the surface. The damaged section of cable will be cut out and a new, slightly longer piece of cable will be spliced in and the cable lowered to the seafloor. The cable will then be reburied. The impacts are similar to those described for the original installation, but much smaller in duration and extent. Because the cable does not contain a coolant fluid like certain other electric cables, there is no potential for fluid release in the event of a damaged cable.

6.5.2 Avoidance and/or Minimization

The most desirable approach for addressing potential environmental impacts is to maximize the avoidance of impacts in all aspects of a project. Avoidance can entail elements such as location, timing, design, and evaluation of alternatives. The second most desirable approach is to minimize impacts. The Applicants have incorporated impact avoidance and/or minimization in all major aspects of the HVDC Transmission System as described below.

6.5.2.1 Underwater Cable

The HVDC Transmission System is designed to primarily utilize an underwater cable route to avoid many potential impacts associated with a cable route located primarily on land. A protected underwater cable has extremely low maintenance requirements, thus there are no reoccurring impacts on water quality and aquatic resources.

6.5.2.2 HVDC Cable Technology

The use of HVDC light cable avoid and/or minimizes effects on aquatic substrate because the cable is small (5½-inch diameter cable) and thus avoids and/or minimizes distortion of the bottom profile in a way that would alter physical conditions in the substrate. In addition, the cable does not contain any fluids that could escape into the aquatic environment.

6.5.2.3 Installation

Cable burial using water jetting or shear plow as the primary installation and burial method establishes the depth needed for cable protection without the use of conventional dredging over the vast majority of the route. This approach avoids and/or minimizes dispersal of suspended solids (and any potential sediment contaminants) since the turbidity plume is small compared to conventional dredging.

6.5.2.4 Horizontal Directional Drilling

The use of HDD to install the cables at shoreline crossing locations avoids and/or minimizes disturbance of the sensitive habitats associated with the shallow water/land interface when the cable must enter and leave the water. With HDD, impacts to shoreline habitats, such as macrophyte beds, wetlands, mudflats, and riparian vegetation, can be avoided and/or minimized.

6.5.2.5 Cable Routing

The cables have been placed to avoid sensitive in-water habitats in most locations. Generally the cables are placed in moderately deep to deep water which avoids productive shallows. The larger ships and barges used for cable installation require a substantial depth to operate (generally greater than 12 feet), thus there is a convergence of habitat protection needs and installation needs. The route avoids submerged and floating aquatic vegetation beds which contain higher densities of benthic life than open water areas in the Hudson River. The route also avoids, to the extent possible, SCFWHs in the Hudson River, where most of those in proximity to the route are associated with shoreline areas. Where the cables pass through these habitats, they are positioned to avoid and/or minimize impacts within the habitat area. For additional information regarding SCFWHs refer to Section 8.4.1.

The route will be aligned to avoid disposal areas, dumping grounds, and spoil areas. Therefore, the HVDC Transmission System is not expected to have any impact on these areas.

6.5.2.6 Substrate Selection

Sand is the preferred substrate for the burial techniques used during installation. The cables are routed through sand to the extent possible, but in some locations, other avoidance factors may take precedence. This preference coincides with the substrate type that generally contains low levels of contaminants compared to silty and organic substrates. The selection of sand avoids and/or minimizes the potential for the dispersal of contaminants and impacts on water quality.

The use of planning and design factors to avoid and/or minimize impacts has reduced HVDC Transmission System impacts on water quality. The HVDC Transmission System will also be designed and installed in a manner protective of aquatic resource and resources relative to accidental or unanticipated events. The HVDC Transmission System will have spill control measures in place, will have personnel trained in and responsible for compliance with permit conditions and requirements, which will be spelled out in detail in the EM&CP.

7.0 FISHERIES

7.1 Shellfish and Benthic Resources

7.1.1 Existing Shellfish and Benthic Resources

Benthic and shellfish communities interact with many of the trophic levels in freshwater, estuarine, and marine environments. Through their diverse life histories they regulate plankton abundance, process sediments, provide food for higher trophic levels, and can be the foundation upon which important commercial fisheries are dependent. Their occurrence within and on substrates makes them a pathway for the movement of contaminants through aquatic ecosystems. Because of their bottom-oriented life histories, they are a component of aquatic environments potentially impacted by the HVDC Transmission System.

Grain size, sediment compaction, substrate characteristics, and currents are among the important factors in habitat selection for benthic invertebrates. As a result of these habitat selection parameters, their distribution can be highly variable over small distances. Major differences occur over the length of the route based on salinity, such as may be observed in the Hudson River, as well as differences between lacustrine and riverine conditions. The benthic community may also differ depending on depth, as the deep water fauna of Lake Champlain or the main river channel, will be distinct from shallow embayments and shoreline areas.

The following sections describe readily available historic data along the route. This historic data has been used to characterize the shellfish and benthic resources and assess the potential impacts associated with cable installation. The Marine Route Survey should be consulted for a more in-depth analysis of existing benthic resources.

7.1.1.1 Lake Champlain

Lake Champlain is one of the largest freshwater lakes in the United States. Its benthic invertebrate community, which includes native mussels, aquatic snail, crustaceans, oligochaetes and insects, supports a diverse ecosystem within the Lake Champlain Basin complex. No comprehensive studies documenting benthic communities have been conducted within Lake Champlain. One study, conducted in the late 1960s, concluded that several of the most abundant species were located in various embayments of the lake (Henson and Potash 1970). Macrobenthos in Mallets Bay consisted of the amphipod *Gammarus limnaeu*s, the isopod *Asellus intermedius*, the chironomid *Chironomus anthracinus*, and snails of the species Amnicola. In Shelburne Bay, the same amphipod was collected, along with three species of burrowing mayflies; *Hexagenia occulta*, *Chironomus fumidus*, and *Pontoporeia affinis*. Among the 10 bays sampled, spread throughout the lake, 53 species of Chironomidae were identified, and each bay was found to be dominated by a different species (Henson and Potash 1970).

Within the Lake Champlain basin, 12 invasive mollusks and six invasive crustaceans have been identified (Table 7-1) (Lake Champlain Basin Program et al. 2005). The invasive non-native zebra mussel (*Dreissena polymorpha*) arrived in Lake Champlain in the early 1990s and has since colonized the entire basin system, although the closely related quagga mussel (*Dreissena bugensis*) has yet to be detected (LCBP 2009c). Zebra mussels are filter feeders that consume large quantities of plankton. The result has been increased water clarity and subsequent aquatic plant growth in shallow areas of the lake which has dramatically altered the lake's native benthic community. The VTDEC and the NYSDEC, with funding provided by the Lake Champlain Basin Program and the two states, have been conducting the Long-Term Water Quality and Biological Monitoring Project for Lake Champlain which is evaluating the Lake's phytoplankton and zooplankton communities as well as the spread of zebra mussel since 1992.

7.1.1.2 Hudson River

The benthic macroinvertebrates of the Hudson River form a well documented and diverse community that includes approximately 300 species of annelids, mollusks, crustaceans, and insects (Levinton & Waldman 2006). The first systematic survey of the Hudson's benthic community was done by Townes (1937). In the 1970s Ristich et al. (1977) and Weinstein (1977) surveyed the benthos from Poughkeepsie to Manhattan. In the 1980s Simpson et al. (1984, 1985 and 1986) and Bode et al. (1986) surveyed the benthic community in the main channel of the Hudson from Troy to New Hamburg. Since 1990, Strayer et al. (1994, 1996, 1998), and Strayer and Smith (1996, 2000 and 2001) have studied the community from Troy to Newburgh (Strayer in Levinton & Waldman 2006).

Benthic community structure and population density varies widely and is determined by many factors such as water quality and sediment type as well as the presence or absence of aquatic vegetation and human alterations. Benthic communities vary in distribution in the Hudson depending on bottom type, salinity, and SAV and location along the River. For example, freshwater snails, clams, chironomids, and insects are present north of Poughkeepsie, whereas there is mixture of freshwater and marine organisms between Stony Point and Poughkeepsie, and a typically estuarine benthos from Stony Point south which are dominated by estuarine worms and crustaceans. The predominant crustaceans in the lower Hudson Estuary include grass shrimp (*Palaemonetes* spp.), sand shrimp (*Crangon septemspinosa*), and blue crab (*Callinectes sapidus*) (Levinton and Waldman 2006). Benthic community density peaks near Manhattan, Kingston, Albany, and in deep troughs along the River (Strayer in Levinton & Waldman 2006).

The benthic macroinvertebrate community has undergone substantial change in recent years, since the invasion of the Hudson Estuary by the non-native zebra mussel in the early 1990s. Deep-water benthic macroinvertebrates, which depend on phytoplankton deposited from upper water layers as a primary food source, declined 33 percent; however, in shallow littoral areas, benthic macroinvertebrate density increased by 25 percent, presumably due to an indirect positive effect of increased water clarity and increased macrophyte/algal production resulting from zebra mussel filter-feeding (Strayer et al. 1998). Native suspension-feeding bivalves (Unionidae: *Elliptio complanata*, *Anodonta implicata*, and *Leptodea ocracea*) have also declined in the Hudson due to the decrease in phytoplankton. Since 1992, native unionid (clam) densities have declined by 56 percent, and recruitment of young-of-year (YOY) unionids has declined by 90 percent (Strayer and Smith 1996; Strayer et al. 1998).

Historically, extensive oyster beds occurred in the lower Hudson River as far north as Haverstraw Bay. Exactly how far up the Hudson River the oyster beds extended is difficult to determine. According to Ingersoll's *The History and Present Condition of the Oyster Industry* (1882), Rev. Samuel Lockwood said that 5 miles above Teller's Point, near Sing-Sing, is the uppermost point "where they ever flourished." In the same work, Captain Metzgar mentioned Rockland Lake as the northern limit and "all the way it was almost continuous oyster bottom." Despite the extent and magnitude of this habitat type, overharvesting and degraded water quality resulted in near extinction of oysters in the lower Hudson River during the early 20th Century. Currently there is considerable interest in restoration of oyster beds in the Hudson River, and a NYSDEC-sponsored restoration effort is underway.

An introduced bivalve, the Atlantic rangia (*Rangia cuneata*), native to the United States Gulf Coast, has become established in the lower Hudson River Estuary and is abundant in the Tappan Zee and Haverstraw Bay. Prior to 1955, this species was unknown from East Coast estuaries, but has become widespread in the Hudson and other mid-Atlantic waters within the past several decades. Potential vectors of introduction include ballast water, bait buckets, and oyster restoration program (using Gulf coast shells or live oysters). Atlantic rangia were first reported in the Hudson in 1988 (Strayer 2006). The long-term ecological significance of the Atlantic rangia's introduction to the Hudson River is poorly understood; however, the potential effects of a successful benthic suspension feeder on trophic dynamics, native bivalves, and plankton communities in a large, shallow bay may be significant.

Very recently, another invasive benthic species has appeared in the Hudson River Estuary - the Chinese mitten crab (*Eriocheir sinensis*). Three specimens have been collected from the mid-lower estuary since June 2007. Native to eastern Asia, the Chinese mitten crab is an important food in its native waters and supports a large aquaculture industry. The Chinese mitten crab is highly prolific and omnivorous, competing aggressively with native macrocrustacean populations where it has become established. Burrowing activity by Chinese mitten crabs has led to damage to native vegetation and increased shoreline erosion. NYSDEC has issued a "Mitten Crab Alert, seeking assistance from the public in reporting any additional sightings or collections" in New York waters (Dey 2008).

Below is a summary of some representative surveys on the benthic communities within the Hudson River and includes a discussion on riverwide surveys as well as site-specific surveys.

Riverwide Surveys

Simpson et al. (1985) sampled the benthic community from 16 stations from Glenmont, New York to New Hamburg, New York in the main channel of the Hudson River. Samples were collected using a Petite Ponar grab sampler and a diver-operated Hess sampler; 117 species of macroinvertebrates were identified. The fauna was dominated by tubificid worms, clams, snails and chironomids with the family Chironomidae (non-biting midges) representing the most diverse group with 40 taxa recorded. The common oligochaete worm, *Limnodrilus hoffmeisteri*, was the most abundant species, contributing 54 percent of the total number of specimens collected and 74 percent of 79 percent of the total biomass. The study noted that the most diverse benthic communities were correlated to the most heterogeneous substrates with various sized sands mixed with silt (Simpson et al. 1985, and Simpson et al. 1984).

In 2000 and 2001, NYSDEC conducted the Hudson River Biocriteria Project to develop indicators of biological conditions for the Hudson River Estuary. The goal of the project was to develop one or more biological indicators that could be used to assess the ecological condition of the estuary through long-term monitoring. A total of 278 benthic samples were collected from the Troy Dam to the Battery (i.e., southern tip of Manhattan) (Figure 7-1) (Llanso et al. 2003). Benthic samples were collected with a Young grab (0.044 m^2 surface area to a depth of 10 cm) and washed through a 0.5 mm sieve. Based on cluster analysis of species abundances, samples were classified into three habitats according to salinity; tidal freshwater (Albany to Peekskill), oligohaline (Peekskill to Yonkers), and mesohaline (Yonkers to the Battery). The tidal freshwater was further divided into two sediment classes; sand or mixed sediments, and mud.

The number of benthic invertebrate species per sample ranged from 1 to 27, and the mean increased with the salinity gradient and in freshwater sands (Table 7-2). Species richness averages were typical of estuarine benthic communities of low salinity habitats. Species were categorized as infauna or epifauna. Total abundance varied widely among sites, with densities ranging from 68 to 39,600 individuals per m^2 (Table 7-3). Mesohaline and freshwater sand habitats had higher mean densities than oligohaline and freshwater mud habitats (Llanso et al. 2003).

Biomass was on average higher at oligohaline sites, where clam beds were found. High biomass values in tidal freshwater sands resulted from the presence of zebra mussels. Sites with high densities of organisms were numerically dominated by tubificid oligochaetes. Oligochaetes were dominant in freshwater sites while polychaetes were dominant in mesohaline sites (Table 7-3). Crustaceans (mostly amphipods and isopods) were abundant in oligohaline and freshwater sites, and mollusks were particularly important in the clam beds of the oligohaline salinity zone (Table 7-3). A complete list of species by habitat is provided in Table 7-3 (Llanso et al. 2003).

In 1998 and 1999 the NYSDEC Benthic Mapping Project conducted the initial phase of the project and mapped 40 miles of the Hudson River Estuary (about one third of the area of the estuary). This phase included four areas: (1) a reach north of and including the Tappan Zee Bridge, (2) Newburgh Bay, (3) the reach from Kingston to Saugerties, and (4) the reach from the City of Hudson to the south end of Schodack Island. In each reach benthic grabs and Sediment Profile Imaging (SPI) were used to assess and describe the benthic community. In addition, remote sensing techniques were used to characterize bathymetry and sediment types. The survey has identified historic bands of now inactive oyster beds in the area of the Tappan Zee and Haverstraw Bay. Recently, active mussel beds have been discovered at the base of the Tappan Zee Bridge (NYSDOT 2007).

Site Specific Surveys

A total of 126 samples were collected at 14 stations (n=3) located in the Hudson River just off Athens, New York using a 0.05 m^2 Ponar grab in August and November of 2001, and April of 2002. This location is to the north of the entry point of the HVDC Transmission System into the Hudson River. Seven stations were located in shallow water (10 feet or less) and seven stations were located in deep water (14 - 22 feet). Fluctuations in density and species composition were observed between sampling months (August and November 2001 and April 2002). Within the channel, the macroinvertebrate community was typical of a low-salinity estuarine habitat and included segmented worms, small crustaceans, insect larvae, and clams. Arthropods, particularly insect larvae, dominated the collections in terms of numbers of different taxa, although amphipods (*Gammarus* spp.) and isopods (*Cyathura polita*) also were common in the samples (USACE 2003). Mollusks (clams and snails) were the next most diverse group, followed by annelids, particularly oligochaetes (segmented worms). Overall, arthropods were the numerically dominant major taxon, followed by annelids, mollusks, platyhelminthes (flatworms) and rhynchocoels (ribbon worms). In general, the survey found the macroinvertebrate community to be composed of species that were broadly adaptable to changing environmental conditions (e.g., salinity, temperature, dissolved oxygen, etc.) and tolerant of environmental perturbations and pollution (USACE 2003).

Menzie (1981) studied the chironomid (non-biting midge) fauna of a vegetated tidal embayment of Haverstraw Bay. The dominant chironomid species inhabiting the beds and adjacent shallow unvegetated areas was *Crictopus sylvestris*. Additional numerically dominant taxa included *Dicrotendipes, Tanytarsus, Polypedilum,* and *Parachironomus* species. Chironomid density in vegetated areas was 16 times that of adjacent non-vegetated areas, and Menzie estimated that the chironomid standing crops in the vegetated areas would represent 14 to 25 percent that of Haverstraw Bay, representing an important prey resource for juvenile and forage fishes, including alewife, which forage in shallows at night, and predatory invertebrates such as damselfly larvae (*Enallagma durum*), and gammarid amphipods, which are in turn consumed by fish.

In 2000, a benthic sampling program was conducted to determine if there were any unique or special physical habitats or aquatic life conditions along the route across Haverstraw Bay for the proposed Millennium Pipeline. Samples were collected using a 0.1 m^2 Smith-McIntyre Grab at seven stations along the proposed route, a 2.1-mile stretch from Bowline Point, Haverstraw, to Veterans Administration hospital property on the eastern shore. One reference sample was collected in the navigational channel approximately one mile south of the proposed cable route, Table 7-4) lists a summary of macroinvertebrates collected and analyzed (LMS 2001).

In addition, grass shrimp (*Palaemonetes pugio*), sand shrimp (*Crangon* spp.), opossum shrimp (*Neomysis americana*), and blue crab (*Callinectes sapidus*) are abundant in Haverstraw Bay's open waters and tidal shallows. The two shrimps and the mysid species are critical food resources for many juvenile and adult finfish, including weakfish, striped bass, and white perch. Larval life stages of blue crab, zoea and megalopae, require relatively high salinities and are abundant in this portion of the lower Estuary.

An eight-month survey of epibenthic fauna of Croton Bay, New York was conducted in 1974. Thirty-nine genera were collected including amphipods, isopods, decapods, chironomids, gastropods, polychaetes, barnacles, and mussels. Although sampling stations were not located along the proposed cable route, the epibenthic organisms collected from Croton Bay are representative of the fauna present in similar habitats of a large portion of the Tappan Zee and Haverstraw Bays (Crandall 1977). Species abundance and diversity varied over the eight-month study Amphipods were present in great numbers during all sampling periods. The three most abundant amphipod species were *Gammarus tigrinus, G. daiberi* and *Corophium lacustre*. The mud crab, *Rhithropanpeus harrisii*, was the only crab collected and was numerous in bay traps from June to October. Oligochaetes were present during all sampling periods as well as the polychaete *Hypaniola gayis* (Crandall 1977).

The benthic community of the Hudson River near Ossining, New York was sampled at monthly intervals between May 1972 and April 1973. Samples were collected using a Peterson grab at six stations; one southern Haverstraw Bay, four off of Ossining, and one north of Tappan Zee (Williams et al. 1975). Among all stations sampled, the copepod order Harpacticoida was collected at the highest average densities. Snails of the species *Amnicola* and the mollusk *Congeria leucophaeta* were the other most densely collected species, while all others made up less than 3 percent of the total collected. Seasonal fluctuations in species abundance and diversity were observed, in general the number of taxa and individuals observed during the spring seemed to be attributable to high levels of freshwater run-off which is typical in a tidal estuary.

7.1.1.3 Harlem River and East River

Both the Harlem River and East River have undergone significant modifications as a result of channelization, bulkheading, upland filling and urbanization along their shorelines. The majority of benthic invertebrate species found in these habitats are tolerant of highly variable conditions, with salinity ranging from estuarine to marine concentrations. Biological surveys of these areas have found the benthic community to be comprised of both suspension and deposit feeders, including polychaetes, crustaceans, and bivalves.

In 2002, Energy & Environmental Analysts, Inc. (EEA) collected six ponar grab samples in the Harlem River along the bulkhead between the Third Avenue Bridge and the Willis Avenue Bridge and between Piers 6 and 9 on the East River (EEA 2002). Samples were dominated by polychaete worms. In both locations, *Streblospio bendicti* and Capitellidae were the dominant organisms. Review of the benthic invertebrate data revealed that both pollution indicative and pollution sensitive species were enumerated (i.e., slight contamination by pollutants of the sediment was evident, although not concentrated enough to displace the pollution sensitive species).

The benthic community south of the Third Avenue Bridge, in the Hell Gate at east 91st street, was sampled as part of the EIS for the City of New York Comprehensive Solid Waste Management Plan. *Streblospio benedicti* comprised the majority of the individuals collected (16,952 out of 22,801), indicating a pollution altered environment. Oligochaeta were collected in the next highest numbers, although not nearly as frequently as *S. benedicti* (1,738 and 1,637, respectively) (NYC Department of Sanitation 2005).

Numerous surveys of the benthic community in the waters surrounding Manhattan have been conducted. Although these surveys were not conducted along the proposed underwater transmission cable route, they provide an indication of the likely existing benthic community in these water bodies. Hazen and Sawyer Engineers (1981) conducted a survey of East River benthos near the Brooklyn shore south of Newtown Creek. Forty-four species were collected in the survey with polychaetes being the dominate group found living in sand and mud bottoms. Tunicates were the dominate organisms living on hard bottom areas and clams were dominant in the soft substrates. Dense populations of the tube building polychaete, *Sabellaria vulgaris*, were found near rocky ledges. *Mytilus edulis*, the blue mussel, was found attached between the worm casings (Hazen and Sawyer 1981). A total of 33 taxa at an average density of 624 organisms per m^2 were collected from the East River during field sampling using a Ponar Grab with species represented from the Annelida, Arthropoda, and Molluska phyla (HydroQual 2001). The crustaceans in the Arthropod group, however, occurred infrequently among the stations and in relatively low numbers compared to annelids and mollusks (HydroQual 2001).

A survey of the benthic community living in the seabed under piers and between piers was conducted by EEA (1989). Sediment samples for benthos were collected using a standard Ponar Grab from inter-pier areas off South Manhattan piers 13 and 17. The infaunal community living in the seabed below piers was significantly more abundant ($p<0.001$) and contained more species ($p < 0.001$) than the community measured in samples collected from the open seabed. Important benthic species that were high in abundance were the polychaetes, *Polydora sp., Glycera sp., Eteone heteropoda*, *Nereis succinea*, *Heteromastus sp.*, *Pectinaria gouldii*, amphipods, *Microdeutopus gryllotalpa, Unciola serrata, Paracaprella tenuis, Corophium insidiosum, Jassa marmorata*, the isopod *Edotea triloba*, mollusks *Mya arenaria*, *Crepidula fornicata*, mussels, and the tunicate *Molgula manhattensis* (Woodhead et al. 1999).

7.1.1.4 Commercially and Recreationally Important Shellfish

Shellfish and other benthic resources of Lake Champlain and the Hudson River are not harvested for commercial or recreational purposes, either because of a lack of harvestable species or contamination. In the estuarine portion of the Hudson River, Harlem River and East River, the NYSDEC has designated the shellfish lands in Westchester, Bronx, Kings, New York, and Queens counties as uncertified areas and shellfish shall not be taken for use as food (NYSDEC 2010). Historically, shellfish populations in the Hudson River, Harlem River and East River were significantly higher than the current population, especially the eastern oyster (Levinton 2006). However, the Hudson River offers important habitat to several species of shellfish, including mollusks, such as the razor clam or Atlantic jackknife (*Ensis directus*), blue mussels (*Mytilus edulis*), hardshell clams (*Mercinaria mercinaria*), and eastern oyster (*Crassostrea* *virginica*), and crustaceans such as the blue crab (*Callinectes sapidus*), Portly spider crab (*Libinia emarginata*), and American lobster (*Homarus americanus*).

Within the Hudson River Estuary there is a recreational and commercial fishery for blue crabs. NYSDEC observed fishing activity was distributed around four major areas; Piermont, the Tappan Zee Bridge, Stony Point and Poughkeepsie. In 2001, the number of bushels of blue crabs collected in July, August and September ranged from 76 to 102 (NYSDEC 2002).

Both commercial and recreational blue crab fisheries exist in the lower Hudson River, with efforts concentrated during the late summer and early fall. In shallow waters, crabs are primarily harvested with crab pots (traps) or trotlines. Dredges and scrapes are used by the commercial fishers later in the season to capture overwintering crabs buried in sediments. Relative to the overall New York, New Jersey and Delaware blue crab fishery, New York landings are small, and the Hudson River landings represent only a minor percentage of total landings in New York State. Although average PCB concentration in crab tissues is relatively low (<1 ppm), concentrations of PCBs (and other toxins) in the crab hepatopancreas (a.k.a. "mustard, liver, or tomalley") are higher (>5ppm). The NYSDOH has issued a consumption advisory for blue crabs in the Hudson River.

7.1.2 Avoidance and/or Minimization of Potential Impact

Benthic invertebrate and shellfish resources may be potentially affected by cable installation as a result of the disturbance of the substrate during cable burial. The dispersal of sediments, some of which may contain chemical contaminants, can affect the resources in the near vicinity of the disturbance. The interaction between the cable installation process and benthic and shellfish resources involves aspects which apply throughout the underwater transmission cable route. Also, many actions to avoid and/or minimize impacts are designed into the installation process and the route selection. Avoidance and/or minimization of l impacts, if any, to threatened or endangered wildlife species under 6 NYCRR Part 182 and endangered and threatened species under the federal Endangered Species Act ("TE species") found along the route are discussed in Section 9.

Section 1 describes the construction equipment, installation procedures, and temporal aspects of cable burial as well as the various methods of installation that will be used along the route. The potential impacts to the benthic community found along the underwater transmission cable route will depend on factors such as substrate and sediment type, water depths, as well as hydrodynamics. In most soft bottom habitats, impacts are expected to be temporary and localized. Many of the existing benthic species are relatively tolerant to burial or smothering as a number of the infaunal species are deposit feeders and can burrow. In addition, the tube dwelling organisms may be able to survive burial by extending their tubes or constructing new tubes at the surface. As the majority of the underwater transmission cable route is tidal, the existing benthic community typically experiences periods of naturally occurring increases in suspended sediments (i.e., storm events). The potential impacts of each installation technique are discussed below.

7.1.2.1 Jet Plow / Water Jet Installation

Over a majority of the underwater transmission cable route, the sediment will be fluidized to a trench depth of approximately 7 feet or more in a linear path approximately 2 feet wide, with an additional surface disturbance of two 3-foot wide water jetting device skids, wheels, or support frame. Jet plowing could potentially impact benthic communities found along the trench in several ways. Trenching activities may dislodge invertebrates from and on the sediments and put them into suspension where some will sink into the trench and some may be displaced to the substrate adjacent to the trench. The high pressure of the jetted water may result in mortality of soft-bodied benthos that are in direct contact with the jetted water. More mobile benthos may sense sediment movement (vibration) as the water jetting device approaches and move away from the approaching water jetting device.

Approximately 80 percent of the fluidized sediment will redeposit back into the trench. The remaining sediment will be deposited on undisturbed substrate adjacent to the trench and may bury some invertebrates and shellfish. Specific tolerance to the sediment deposition is dependent on the species and the depth of sediment deposition at any given location. Other species, such as clams and mussels can also use their muscular foot to reposition themselves upwards through relatively thinly deposited sediments. Any contaminants potentially adsorbed to sediments will either resettle in the trench or in adjacent areas, thus the benthic organisms will be exposed to similar levels of contaminants in sediments as before the installation process. Jet plowing and the associated re-suspension of sediments, although insignificant, may have a localized effect on the pelagic larval stage of benthic species. Given that the increased turbidity occurs near and immediately down current of the jetting, only a very small number of larvae within the system may be affected at any given time. In addition, the water used in the jetting process will be withdrawn from the water adjacent to the jetting vessel or the water jetting device, depending on the equipment selected.

7.1.2.2 Shear Plow Installation

As with the water jet technique, during shear plow installation, the substrate is impacted along a linear trench with the majority of the material and benthic life falling back into the trench. Some material and benthic organisms will settle adjacent to the trench on undisturbed substrate. Any contaminants potentially adsorbed to sediments will either resettle in the trench or in adjacent areas.

7.1.2.3 Conventional Dredging

In areas where the cable crosses a navigation channel and at landfall locations, conventional bucket dredging will be used to pre-dredge in order to achieve authorized cable burial depths, remove accumulated sediment in an existing maintained channel, and for HDD entry and exit pits. The dredged material will be placed in scows and removed for placement at a permitted location. This dredging will have a localized impact l on benthic life removed in the limited area prepared for cable installation. In addition, dredging may result in sediment re-suspension similar to water jetting as the bucket is brought to the surface. The jet plow will then install the cables in the pre-dredge area, in which case there will be no additional impact to benthic life. Accordingly, the overall impact of this construction technique will be insignificant.

7.1.2.4 Concrete Mat Protection

In areas where the cable cannot be buried, primarily along rocky substrates or at existing utility crossings, articulated concrete mats will be used to cover the cables to provide protection. This technique will bury the existing substrate and associated benthic life and create a new hard surface substrate on the exposed surface of the mats. In areas of hard bottom, the mats will create similar habitat, and in soft bottom areas the mats will, in essence, create small artificial patch reefs. The surface of the mats may develop an epibenthic community over time as well as provide structure that is important for some benthic species and fish. The mats will have an insignificant effect on near bottom hydrodynamics, which may be similar to the conditions found in rocky bottom areas.

7.1.2.5 Horizontal Directional Drilling

HDD will be used where the cables enter and leave a waterbody to avoid disturbance to the shallow water interface between land and water. A sheetpile cofferdam with an entry/exit pit may be established nearshore within which the connection will be made between the buried cables and cables extending offshore through the directionally drilled conduit. The cofferdam would be approximately 16 feet by 30 feet with a dredged entry/exit pit typically 8 feet deep. Driving sheetpile will have an insignificant impact on the substrate and will only create a small amount of suspended sediment. Dewatering and dredging within the cofferdam will remove the substrate along with associated aquatic life. The dredged material will be stored in a scow for replacement after the connection is made. The cofferdam will contain all turbidity associated with dredging and subsequent replacement and re-contouring of the substrate. Removal of the sheetpiles will create localized turbidity in a very small area. If a cofferdam is not used then the entry/exit pit will be conventionally dredged and the associated impacts will be similar to those described above for conventional dredging.

If a cofferdam is not used at the entry/exit pit, potential impacts during directional drilling will include sediment disturbance at the exit/entry hole and may include the release of drilling fluids. Sediment disturbance at the entry/exit hole will be limited to the area surrounding the drill head. Directional drilling operations will avoid and/or minimize the potential breakthrough of drilling fluids to the waterbody through monitoring of drilling fluid volume, development and implementation of a drilling fluid loss response plan, and the use of appropriate bentonite drilling fluids that solidify upon contact with water. In the unlikely event of drilling fluid release, the bentonite slurry will settle in a cohesive mass that is easily removed from the waterbody floor. If an inadvertent release of drilling fluid from the drill hole upwards through the sediment overburden occurred, gelatinous drilling fluid will flow outward from the point of discharge and cover the bottom. Depending on currents or wave action, some of the deposited drilling fluid could become suspended or more dispersed. Drilling fluid, composed primarily of bentonite clay and water, if suspended, may potentially have similar impacts on benthic life as those described above for jetting induced suspended sediments.

7.1.2.6 Vessel Positioning

While it is anticipated that the majority of the cable installation will be performed using dynamically positioned vessels, certain activities will require anchored, spud moored, or jack-up vessels. Traditionally, conventional dredging is performed from spud barges, and it may be necessary to use these barges to support the work at the HDD entry/exit hole. The size of the spud barge legs will be dependent on the size and type of the barge, but it is anticipated for this work the leg sizes could be from 2' x 2' to 5' x 5'. Jack-up legs are likely to have pads that range in size from approximately 80 to 300 square feet. The contact point on the bottom for the anchor, spudding or jack-up legs would compact the sediments as they sink and cause localized resuspension of sediments as the anchor/legs are lowered and raised. This would potentially have a localized impact on benthic individuals and benthic habitat. In areas containing submerged aquatic vegetation (SAV), the vegetation would be matted down which would be expected to cause mortality in the footprint of the anchor or leg. The areas affected by the anchor or legs would gradually experience a rebuilding of the characteristic sediment type in the impacted area and benthic invertebrate and SAV production would be expected to return. The number of areas where this equipment would be used is very limited, thus the overall impact of this construction technique would be insignificant.

7.1.2.7 Spills and Unintentional Releases

Although unanticipated, there is the potential that fuel, lubricants, or hydraulic fluids could accidentally be released into the water in the event of equipment failure or human error. The HVDC Transmission System will be constructed with an agency approved SPCC Plan or its equivalent and other BMPs which will be detailed further in the EM&CP, and the necessary materials will be maintained on site to handle small spills or releases. For larger releases, a specialized cleanup contractor will likely be retained for immediate response. In the event that a hydrocarbon based liquid is accidentally released to the aquatic environment, and assuming rapid response, there will be an insignificant impact on benthos, other than during the spawning period when pelagic larvae could be affected through toxicity effects.

7.1.2.8 Cable Repair during Operation

During HVDC Transmission System operation, the only potential impact to benthic resources will occur in the event of a need to repair a section of the cable. In this instance, a jet plow may be used to expose a length of the cable on either side of the repair location. The cable will then be cut and the ends brought to the surface. The damaged section of cable will be cut out and a new, slightly longer piece of cable will be spliced in and the cable lowered to the seafloor. The cable will then be reburied. The impacts are similar to those described for the original installation, but much smaller in duration and extent. Because the cable does not contain a coolant fluid like certain other electric cables, there is no potential for fluid release in the event of a damaged cable.

7.1.2.9 Thermal Effects

The cables will produce heat during operation, that will be dissipated at depth, such that in the top 6 inches of the sediment, where most benthic infauna occur, there will be an insignificant temperature increase, and one that will not have an impact on benthos. This effect will be further reduced on the sediment surface, since the movement of the overlaying water will result in further, rapid heat dissipation. Any measurable amount of local heat generation would be limited to a narrow corridor along the cable (Worzyk 2009). See Section 7.2.2 below for further discussion.

7.1.2.10 Electromagnetic Field

During HVDC Transmission System operation, the cables will produce electromagnetic field (EMF). Very little is known about the effects of EMF on benthic infauna and epifauna. The World Health Organization (2005) reports that "none of the studies performed to date to assess the impact of undersea cables on migratory fish (e.g., salmon and eels) and all the relatively immobile fauna inhabiting the sea floor (e.g., mollusks), have found any substantial behavioral or biological impact." Given the relative primitiveness of these species, and the negligible mobility of many benthos, it is likely that the HVDC Transmission System will have an insignificant impact on benthos from the EMF produced by the cables. See Section 7.2.2 below for further discussion.

7.1.2.11 Impact Assessment

There may be a temporary impact on benthic invertebrates along the cable route where it is buried in the substrate or covered by concrete mats. Because the cables occupy a narrow linear corridor, the area of disturbance is an insignificant portion of the waterbodies through which it passes. An exception to this is the narrow southern end of Lake Champlain before exiting the water in the Town of Dresden where the footprint for cable installation may occupy more than 10 percent of the width of the waterbody. In all locations, there are substantial areas of substrate adjacent to the HVDC Transmission System construction that are sources of organisms to recolonize the areas impacted by the cable installation.

Suspended sediments may have either positive or negative impacts on growth in bivalves, depending on the type and concentration of the particulates, as well as the bivalve species (Bricelj et al. 1984). For example, while three-week growth rates of juvenile hard clams were not significantly affected by sediment concentrations (with 10 percent organic matter) up to 25 mg/l, there was a significant reduction in growth and condition at 44 mg/l (Bricelj et al. 1984). On the other hand, growth enhancement by the addition of silt to an algal diet has been reported in mussels, surf clams, and oysters.

Because the need for maintenance of the cables (removal from the substrate) occurs very rarely, there is expected to be no recurring impacts on the substrate. In areas potentially impacted by the cable installation, the rate of recovery will vary by substrate type, benthic community composition and potentially many other factors. Many benthic species, via planktonic larvae, have evolved reproductive strategies focused on colonizing newly created or recently disturbed substrates. Other mobile benthic species will colonize the disturbed sediments from adjacent undisturbed areas. Studies which have investigated benthic recovery after disturbance in freshwater, estuarine, and marine environments support the position that recolonization is rapid. Functional habitat can develop within weeks in some communities and full functionality can return on the order of one year (NJDEP 1984; LMS 1984; EEA, 1989a, 1989b).

Full recovery of the benthic community is contingent upon reestablishment of the physical habitat conditions that were present before the cable installation. The forces that shape the physical aspects of benthic substrates, primarily currents and sedimentation, operate on a scale far greater than the localized effect of cable installation. The disturbance related to installation will have no influence on these forces, thus they will begin to reshape the disturbed substrate immediately after installation is completed. Because the cable occupies an insignificant volume of the substrate (5½-inch diameter cable), and will in most instances be buried well below the sediment surface it will not interfere with the actions of these forces in reshaping the substrate. Important substrate factors for benthic organisms are the grain size distribution (composition) and compaction within the substrate. The original conditions in the substrate are expected to become restored because the substrate is the parent material and the forces acting on the sediments are unchanged.

In areas where conventional dredging is employed, typically for deeper burial areas such as at crossings of a navigation channel, construction will involve sediment removal, cable-laying, and then backfilling. Depending on the nature of the backfill, the sediment surface characteristics could be altered since it is unlikely that exactly the same grain size composition will be created as existed prior to cable installation. Depending on currents and erosional forces, backfill will be used that is anticipated to remain in place. However, whatever the backfill characteristics are, they are likely to become colonized over time with benthic organisms. Given the small amount of anticipated conventional dredging, any modified substrate characteristics will have an insignificant impact on benthic species.

Potential impact on the ecological functionality in the benthic community from cable installation will be localized and short term. Any impacts will be insignificant because there are no structures remaining in the waterbody that could influence hydrodynamics or sedimentation, other than in those small areas where concrete mats will be employed. Contaminants, if present, may be redistributed locally, but the HVDC Transmission System will add no contaminants nor influence the forces that control the fate or transport of existing contaminants. An insignificant redistribution of contaminants will not alter the average exposure of benthic organisms to contaminants that are already present.

Throughout the route there are populations of non-indigenous, invasive species, with greater abundances of such species in the freshwater portion of the Hudson River and Lake Champlain. Benthic invertebrate and aquatic plant invasives have had documented adverse impacts on these ecosystems. The short term, localized impacts of substrates should not alter the distribution or abundance of invasives because the cable installation process does not create a unique mechanism for the dispersal of invasives. The ships and equipment used in cable installation will not result in any impacts greater than those caused by ship wakes and prop wash or the effects of major storms and high water events in riverine areas.

Modeling analysis shows that the increase in sediment temperature, as well as changes in the natural magnetic fields (total magnetic field and compass deflection) is limited to a small area of influence. Any change in water temperature is insignificant, probably not detectable, while the sediment surface temperature is may increase slightly more than 1ºC for the proposed burial depth. These analyses are conservative in that they are based on an assumption of a clay/silt substrate. With regard to magnetic field, the model analyses show that a 6-foot burial depth produces a change in total magnetic field extended up to 30 feet from the cable centerline depending on the arrangement of the two cables. Any change diminishes rapidly beyond 10 feet from the centerline. Given the low level of any changes as a result of the operation of the proposed cables and the small spatial extent of these changes, the HVDC Transmission System is anticipated to have an insignificant effect on any benthic species.

7.1.2.12 Avoidance and Minimization

The first and most desirable approach is to maximize the avoidance of impacts in all aspects of a HVDC Transmission System. Avoidance can entail elements such as location, timing, design, and evaluation of alternatives. The Applicants have incorporated impact avoidance and/or minimization measures in all major aspects of the HVDC Transmission System as described below:

<u>Underwater Cable</u>

The selection of an underwater cable avoids and/or minimizes many potential impacts associated with a route sited on land. With regard to benthic invertebrates and shellfish, it permits options for locating the cable to avoid concentrations of benthic life while placing the cable in an environment that can recover quickly from potential impacts. A protected underwater cable has extremely low maintenance requirements, thus there are no expected reoccurring impacts on aquatic resources. In addition, the Applicants have placed the cables in a single trench to reduce the expected levels of magnetic fields and propose to bury the cables to a depth of six feet for this configuration.

<u>HVDC Light Cable</u>

The use of HVDC light cable avoids and/or minimizes effects on aquatic substrate because the cable is small (5½-inch diameter cable) and thus avoids distortion of the bottom profile and any alteration of the physical conditions in the substrate. In addition, the cable does not contain any fluids that could escape into the aquatic environment.

<u>Water Jetting</u>

Cable burial using a water jet system establishes the depth needed for cable protection without the use of conventional dredging over the vast majority of the route. This approach produces much less dispersal of suspended solids, turbidity plumes, and contaminants compared to conventional dredging.

Horizontal Directional Drilling

This technique avoids and/or minimizes impacts on the sensitive habitats associated with the shallow water/land interface when the cable must enter and leave the water. With HDD, impacts to shoreline habitats, such as macrophyte beds, wetlands, mudflats, and riparian vegetation can be avoided and/or minimized.

Cable Routing

The underwater transmission cables can be placed to avoid sensitive in-water habitats in most locations. Generally the underwater cables are located in moderately deep to deep water which avoids productive shallows. The ships and barges used for cable installation also require a substantial depth to operate, thus there is an alignment of habitat protection and installation requirements. The underwater cable route avoids and/or minimizes construction in SCFWHs in the Hudson River. Where the cables pass through these habitats, they are positioned to avoid and/or minimize adverse affects within the habitat area by being placed in the deeper water areas. Additional information on wildlife in SCFWH areas is provided in Section 8.4.1.

Substrate Selection

Sand is the preferred substrate for the burial techniques used during installation. The cable is routed through sand to the extent possible, but in some locations, other avoidance factors may take precedence. This preference coincides with the substrate type that generally contains low levels of contaminants compared to silty and organic substrates. The selection of sand avoids and/or minimizes the potential for the dispersal of sediments potentially containing contaminants and impacts on benthic life.

The use of project planning and design factors has reduced HVDC Transmission System impacts on benthic invertebrates and shellfish to an insignificant amount. The Applicants will continue discussions with resource agencies and incorporate other approaches, as needed, to avoid and/or minimize potential impacts. Other approaches that have been employed on some projects in the past to avoid and/or minimize potential impacts to aquatic life, but are not exclusive to benthic life, include implementation of construction windows for the timing of installation to avoid fish migration, spawning and the seasonal presence of TE and non-TE species; the application of BMPs to conventional dredging; and BMPs applied to staging areas and equipment handling for use in the aquatic environment.

The HVDC Transmission System will also be designed and installed in a manner to avoid and/or minimize potential impacts to benthic habitats and resources in the event of accidental or unanticipated events. The HVDC Transmission System will have spill control measures in place, will have personnel trained in and responsible for compliance with permit conditions and requirements, which will be spelled out in detail in the EM&CP.

7.2 Finfish

This section describes finfish in three areas; Lake Champlain, the Lower Hudson River (south of Albany), and the East River. The fish species of the Harlem River are similar to those in the adjacent Hudson and East Rivers. Fish species present in streams crossed along the underground cable segment are described in Section 5.1.1.3.

7.2.1 Existing Finfish

7.2.1.1 Lake Champlain

Lake Champlain is a large, heterogeneous lake, comprised of four distinct basins separated by a combination of geographic features and causeways constructed over shallow bars. Habitats, trophic state, watershed use, and fish fauna vary among these basins (FTC 2009). The native fish fauna is similar to that of the Great Lakes, although there are fewer species found in Lake Champlain. Currently there are 70 species of fish identified in Lake Champlain (Table 7-5.). Table 7-5 also indicates whether the species is native to Lake Champlain. TE species of fish are discussed in Section 9.1.

The coldwater predator population is dominated by lake trout (*Salvelinus namaycush*), Atlantic salmon (*Salmo salar*), steelhead (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*). Coolwater species include yellow perch (*Perca flavescens*) and walleye (*Sander vitreum*). Coregonid species are limited to lake whitefish (*Coregonus clupeaformis*) and lake herring/cisco (*Coregonus artedi*). Major forage species are rainbow smelt (*Osmerus mordax*) and yellow perch with alewives (*Alosa pseudoharengus*) rapidly increasing in abundance since 2002. Important warmwater sport fishes include largemouth and smallmouth bass (*Micropterus salmoides* and *M. dolomieu*), northern pike (*Esox lucius*), pumpkinseed (*Lepomis gibbosus*), and white and black crappies (*Pomoxis annularis* and *P. nigromaculatus*) (FTC 2009). The NYSDEC and Vermont Fish and Wildlife Department (VTFWD) stock rainbow, lake, and brown trout in the Lake Champlain basin waters and the USFWS stock young Atlantic salmon (LCBP 2009).

<u>Lake Champlain - Migratory Species</u>

Lake Champlain supports a number of anadromous fish species: sea lamprey, alewife, Atlantic salmon, brown trout, and steelhead; and a catadromous fish species; American eel.

Sea Lamprey

Sea lamprey was first noted in Lake Champlain in 1929. This non-native invasive species were thought to have entered Lake Champlain from the Hudson River Estuary through the Champlain Canal or possibly from the St. Lawrence River through the Richelieu River. However, recent studies showed that sea lamprey may be native to Lake Champlain and existed in the lake for approximately 10,000 years (NYSDEC 2010h). Similar to salmon, sea lamprey spend the early stages of their life in streams and rivers, middle stages of their life in saltwater or in large freshwater lake, return as breeding adults to spawn in the freshwater streams and river, and die shortly after spawning. Sea lamprey in Lake Champlain takes approximately six years to complete its life cycle (NYSDEC 2010h).

Spawning takes place during the spring on redds (nests) built by both males and females, with tens of thousands of eggs laid in gravel stream bottoms, which are provided oxygen by the flowing water. The worm-like larval lamprey (ammocoetes) drift downstream with the current and prefer silt/sand stream bottoms and banks in slower moving stretches of water, filter-feeding on algae, detritus and microscopic organisms. This life stage of the sea lamprey in Lake Champlain usually lasts three to four years (NYSDEC 2010h). During the mid to late summer of their third or fourth year, the ammocoetes transform into juvenile sea lamprey and begin life as parasite fish, moving into deeper water to seek host fish on which to feed (NYSDEC 2010h).

Sea lamprey attack mostly lake trout, but a wide range of fish species are also known to be attacked by this species in Lake Champlain (FTC 2009). The Lake Champlain Sea Lamprey Control Alternatives Workgroup (Workgroup) was established by the Secretary of Interior in 2006. The Workgroup reports to the Secretary of Interior and (1) provides advice regarding the implementation of sea lamprey control methods and alternatives to lampricides, (2) recommend priorities for research to be conducted and demonstrate projects to be developed and funded by state and federal agencies, and (3) assist state and federal agencies with the coordination of alternative sea lamprey control research in Lake Champlain and the Great Lakes (FTC 2009).

Alewife

Alewife was presumably introduced into Lake St. Catherine, Vermont, by anglers in 1997 and was later found to make its way into Lake Champlain (Missisquoi Bay) in 2002. This species presents a new challenge for fishery management. This species has been found in great abundance in the lake and could exert major influences on the lake's fish communities by preying on the larvae of many native fish species, and the zooplankton community, and this species contains high levels of thiaminase which could result in early mortality syndrome (EMS) for lake trout and Atlantic salmon that consume alewives thus potentially impeding the establishment of reproducing populations of these two salmonid species (FTC 2009).

Alewife spawn once a year with the annual spawning runs beginning during spring or early summer and may last for up to two months. Spawning lasts only a few days for each wave of arriving fish, after which the spent fish move rapidly downstream. Alewives are broadcast spawners and produce eggs 0.80 to 1.27 mm in diameter which are semi-demersal to pelagic and slightly adhesive. Spawning typically occurs in ponds, lakes, and sluggish stretches of water. Incubation ranges between two to five days depending on water temperature (20 to 22ºC) (Fay et al. 1983a).

Atlantic Salmon

Lake Champlain supports indigenous populations of landlock and/or sea-run Atlantic salmon. This was the first species to show declines as a result of harvest and habitat changes, primarily from stream sedimentation and damming. Sustained stocking began in 1972 with current fall spawning runs and river and lake fisheries maintained by annual stocking of approximately 240,000 salmon smolts and 450,000 salmon fry. In recent years, "wild" adults have been collected from the spawning run in the fall and stripped of eggs to supplement the eggs from domestic broodstock, to periodically replace broodstock, and to develop a Lake Champlain specific strain (FTC 2009).

Brown Trout / Steelhead

Although not endemic, both species are considered to be an important component of the current Lake Champlain fish community, providing a diversity of fishing opportunities and a potential management tool for a changing forage base. Steelhead stocking began in 1972 while brown trout stocking began in 1977. Approximately 78,000 steelhead and 68,000 brown trout were stocked annually into the lake in the mid 2000s. However, steelhead stocking in New York was suspended in 2007 because of the potential to introduce the fish disease Viral Hemorrhagic Septicemia (VHS). Future steelhead stocking will be depend upon alternate hatcheries being able to raise Champlain's steelhead allotment (FTC 2009).

American Eel

American eel enters Lake Champlain from the Richelieu River as yellow eels and spend approximately 10 to 20 years in the lake before returning to the Atlantic Ocean for spawning (FTC 2009). During late winter and early spring, young eels (elvers and glass eels) begin their upstream migration before their pigmentation is complete. They are active at night and burrow or rest in deep water during the day (Facey and Van Den Avyle 1987). The Richelieu River connects northern Lake Champlain to the St. Lawrence River, which supported a commercial eel fishery until it was closed in 1998 before harvest drastically declined (FTC 2009). An eel ladder was constructed at the dams on the Richelieu River in Quebec along with a 10-year American eel stocking program that was implemented in 2005 to enhance eel recruitment into the lake. Between 2005 and 2008, approximately 2.8 million elvers from the Atlantic coast were transferred to the upper Richelieu River (FTC 2009).

<u>Lake Champlain - Ichthyoplankton Seasonal Cycles</u>

A general goal for Lake Champlain fish management is to provide for fish community based on enduring populations of naturally reproducing fish and on the wise use of stocked fish (FTC 2009). Several fish species offer the best available social, cultural, and economic benefits and contribute to a healthy environment. For salmonids, brown trout and Atlantic salmon migrate up streams and tributaries during the fall to spawn on well oxygenated gravel beds, lake trout spawn at the nearshore water of the lake, and rainbow trout/steelheads migrate up streams and tributaries during the spring to spawn. In addition to naturally spawn population, all of these salmonid species are also stocked in the lake to enhance the fishery (FTC 2009).

Similar to salmonids, lake sturgeon migrate up streams to spawn during the spring from May-June. Eggs have been collected in the Lamoille, Winooski, and Missiquoi rivers, and larvae have been collected with driftnets in the Lamoille and Winooski rivers (FTC 2009). Walleye also migrate up streams to spawn during the spring. Spawning typically occurs after ice out when water temperature reaches 5°C. This is an important recreational fish species where millions of fry and hundred thousands of fingerlings have been stocked into the lake between 1988 and 2007 (FTC 2009). Yellow perch spawning is closely associated with aquatic vegetation. Spawning typically occurs after ice-out, at the end of April or early May (Krieger et al. 1983). Esocids (pike and pickerel) spawning conditions are similar to yellow perch occurring during the spring, after ice-out and are closely associated with aquatic vegetation (Inskip 1982; Cook and Solomon 1987).

Centrarchids (sunfish and bass) are nest builders. Largemouth bass prefer gravel substrate for spawning (Stuber et al. 1982) with redds constructed at water depths averaging 0.3-0.9 meter. Spawning begins in the spring, usually between May to June when water temperatures reach 12-15.5°C (Stuber et al. 1982). Smallmouth bass also spawn in the spring, usually from mid-April to July. Spawning takes place on rocky shoals, river shallows, or backwaters with the water temperature reach 12.8-21.0°C (Edwards et al. 1983).

<u>Lake Champlain - Commercial and Recreational Species</u>

Commercial fishing on Lake Champlain was historically dominated by the use of shoreline seines and set lines to capture lake whitefish, walleye, yellow perch, and lake trout (FTC 2009). Additional fish species harvested included basses, bullhead, catfish, eels, northern pike, pickerel, rock bass, smelt, Atlantic salmon, and lake sturgeon. A commercial fishery for yellow eel by electroshocking and baited pots was authorized in Vermont in 1982 but no fishing took place after the 1980s (FTC 2009). With the exception of lake sturgeon and lake whitefish, the harvesting of the walleye and yellow perch fisheries to their declines and extirpations are unknown. Up to 60,000 lake whitefish were harvested annually, until the fishery was closed in 1912 (FTC 2009). Lake sturgeon harvests averaged over 100 fish annually prior to 1913, but declined to less than 15 fish per year in the 1950s and 1960s (Halnon 1963 *as cited in* FTC 2009).

Other species of commercial and sport fishing importance were rainbow smelt, walleye, and yellow perch. Unlike smelt in the Great Lakes, Lake Champlain smelt do not generally ascend rivers to spawn, but spawn offshore in depths around 50 feet or greater and is a popular species during ice fishing (FTC 2009).

Lake Champlain has been stocked by various non-native and native game species to benefit private citizens as well as state agencies. Non-native species that have been deliberately stocked include Chinook salmon (*Onchorhynchus tshawytscha*), kokanee salmon (*O. nerka*), cutthroat trout (*O. clarkii*), grayling (*Thymallus thymallus*), brown trout, rainbow trout, American shad, black crappie, largemouth bass, and carp. Native species stocked in the lake include brook trout, lake trout, Atlantic salmon, brown bullhead, walleye, yellow perch, rainbow smelt, lake whitefish, rock bass, and channel catfish (Langdon et al. 2006 *as cited in* FTC 2009). Majority of the non-native stocked species failed to establish new populations, except for carp, largemouth bass, and black crappie. Limited brown trout and steelhead stocking began again in the 1970s and persists to add diversity to the recreational fishery (FTC 2009).

The current fishery in Lake Champlain is almost entirely based on angling. Commercial licenses are still permitted in Quebec, but the commercial fishery has not been active since 2004. Popular sports fisheries include the four salmonid species, walleye, yellow perch, basses, and pikes. Summer bass tournaments are known to bring substantial revenues to the area and ice fishing, mainly for yellow perch, walleye, and smelt, is popular especially in bays where the water remains ice-covered for several months after the main lake is open. As a result of sea lamprey predation on existing salmonid fishery, charter fishing has declined since the mid 1990s (FTC 2009).

The current commercial harvest in the United States waters of Lake Champlain consists only of the sale of fish caught by angling, or licensed harvest and sale of bait fish with the majority of fish sold being yellow perch, with smelt and panfish also marketed. Few records of catch or sale of fish exist. The 1991 estimated data suggests between 200,000 and 745,000 pounds of fish were sold.

7.2.1.2 Hudson River

The Hudson River fish fauna comprises a mixture of freshwater, diadromous, estuarine, and marine species depending upon location along the length of the river between Albany and the mouth. A total of 210 fish species have been reported from the Hudson River drainage. Of the 210 species, 128 species are found in the main channel of the tidal portion of the Hudson River (Federal dam in Troy to the mouth); the remaining 81 species are confined to tributaries of the lower Hudson River or reported from the upper Hudson River or Mohawk River systems (Daniels et al. 2005). For the 128 species found in the tidal portion of the river, 49 are primarily marine species and 80 species are either resident freshwater or diadromous species (Daniels et al. 2005). Table 7-6 presents the verified fish species in the lower and upper (upstream of the Federal dam at Troy) Hudson River from 1970 to 2003.

<u>Hudson River - Migratory Species</u>

Sturgeons

Two sturgeon species occur in the Hudson River. Sturgeons are long-lived, slow growing species that have suffered serious historical declines because of their value as a high-quality food fish and an important source of shortnose sturgeon caviar. The Atlantic sturgeon is federally listed endangered species and protected over much of its range through fishery management efforts while the shortnose sturgeon is a federally and state listed endangered species (see Section 9 for more details on these species). Sturgeons use large rivers and estuaries almost exclusively during the first five years of their lives. Spawning migration occurs in late winter to early summer (USFWS 1997). Atlantic sturgeon in the Hudson River are associated with the Highlands and Haverstraw Bay/Tappan Zee stretches of the river, which can be fresh or brackish depending on yearly rainfall, and utilize the mid-estuary region above Stony Point (usually oligohaline) for spawning. Shortnose sturgeon in the Hudson River, spawn primarily in the upper freshwater reaches from Coxsackie to Troy. Juvenile sturgeons of both species utilize the Hudson River Estuary exclusively (USFWS 1997).

River Herring

Seven species of true herring occur in the waters of the Hudson River Estuary. These anadromous fish are species that spend most of their adult lives at sea but return to freshwater to spawn. Estuarine herring species include: alewife and blueback herring, collectively known as river herrings; American shad; and the less common hickory and gizzard shad. The marine non-anadromous herring species are Atlantic menhaden and Atlantic herring. The herring family is represented in large numbers with the two marine species dominating the biomass components in the marine ecosystem and the Alosids dominating the biomass in the freshwater ecosystem (USFWS 1997).

Striped Bass and White Perch

The striped bass and white perch, known as temperate river bass, share a number of physical and morphological similarities and are difficult to tell apart during their early life stages. In general, the striped bass is strongly anadromous and highly migratory, while the white perch is more or less restricted to estuarine waters and seldom found in open marine waters (USFWS 1997). Striped bass spawn in the tidal section of the Hudson River from Troy to New York City. The Hudson River is one of two major East Coast spawning areas for striped bass, contributing significantly to the adult population that summers along coastal New England (USFWS 1997).

Sea Lamprey

The sea lamprey is a parasitic anadromous fish that spends its egg and larval life stages entirely in freshwater. At transformation, the process during which the lamprey's body changes into that of a parasite, it moves out to sea and lives on a host fish. After two years at sea, the lamprey returns to freshwater to spawn and then dies (USFWS 1997).

American Eel

American eel is the only catadromous species that spawns in salt water but the young migrate to freshwater to complete their growth and development to the adult stage, in the Hudson River Estuary. American eel are marketed for human consumption, as well as bait for various recreational and commercial fisheries. This species is also an important food source for larger marine and freshwater fishes and is a predator on species such as crabs and clams. American eel spend a considerable amount of time hidden in the substrate (gravel or mud) or under rocks. Young migrants have a propensity for working their way upstream over or around small obstructions, sometimes traveling overland on rainy nights (USFWS 1997).

Atlantic Tomcod

The Atlantic tomcod, not a true anadromous fish species, is fast-growing and short-lived, seldom living past Age 2. This inshore coastal fish moves upstream into brackish waters to spawn. In the Hudson River, this species spawns between November and February in the tidal waters between West Point and Poughkeepsie, New York (USFWS 1997). Due to their short life span and abundance in estuarine systems, as well as sensitivity to environmental stresses, the Atlantic tomcod stock is an excellent measure of environmental health (USFWS 1997). The bay anchovy is a small, delicate, estuarine-spawning, schooling fish that occurs in great numbers in the lower Hudson River Estuary, moving between brackish and saltwater in response to spawning and growth needs (USFWS 1997). This species is often the dominant fish in the Hudson River Estuary and is well suited to the area as planktonic feeders, with detritus from sewage supplementing their main food source. Bay anchovy is an important prey item for striped bass, bluefish, weakfish, white perch, and many piscivorous birds (USFWS 1997).

Hudson River - Ichthyoplankton Seasonal Cycles

The Hudson River Estuary is one of New York's outstanding natural resources, providing crucial nursery and spawning grounds for a wide variety of fish species including freshwater, estuarine migrants, and diadromous species, fish species that spend portions of their life cycle partially in freshwater and partially in saltwater. The largemouth and smallmouth bass, collectively referred to as black bass, are two important Hudson River species with an important recreational fishery, including local and regional fishing tournaments.

In the Hudson River, black bass congregate in five known wintering sites from late October to early April (Nack et al. 1993). These concentrations, located in Coxsackie Cove, Catskill Creek, Esopus Creek, Rondout Creek, and Wappingers Creek, provide a unique opportunity to study seasonal movements. Result of the 1987 and 1998 radio-tagging survey (Nack et al. 1993) showed black bass exhibited movement out of the wintering sites and dispersal up and down the Hudson River to nesting sites from early April to late May. Spawning for black bass typically takes place from May to June. Overall, bays and coves were the habitats selected by most nesting radio-tagged largemouth bass, while creek mouth and shallow, exposed shoreline were the least preferred nesting sites (Nack et al. 1993).

Estuarine fishes are resident species of tidal waters where salinities range from tidal fresh to marine, or from 0.5 to 30 ppt (Table 7-7). The species in this group are known to stray into nontidal freshwater or, at the other extreme, into the coastal region of the marine environment (USFWS 1997). In general, estuarine fishes spawn in salinities greater than 5 ppt, and are not known for mass spawning migrations as are many of the anadromous fish that use the estuarine area as migration pathways. Most estuarine species begin spawning in late spring and continue throughout most of the summer, with an optimum spawning salinities between 5 to 20 ppt (USFWS 1997). Estuarine fishes generally exhibit a seasonal onshore and offshore movement pattern, i.e., upstream and toward shore during the spring and summer, and downstream to deeper waters during the fall and winter (USFWS 1997). The spawning zone for many of the fish species in the Hudson River Estuary range from freshwater to estuarine to marine conditions. The eggs of many of the species are demersal or bottom nesting with majority of the spawning taking place from March to August.

The early-mid 1970s (1971-1977) ichthyoplankton collections in the vicinity of Bowline Point Generating Station recorded a total of 19 species. Fish collected were dominated by bay anchovy, Atlantic tomcod, striped bass, white perch, and Alosids (alewife and blueback herring). Seasonal shifts in abundance of the dominant species were observed, with Atlantic tomcod peaking in early spring, followed by white perch, Alosids, and striped bass in late spring-early summer, and bay anchovy from mid-late summer (LMS 1978).

In an entrainment study conducted at the Bowline generating station in 1987, bay anchovy dominated entrainment samples by several orders of magnitude relative to other species (EA 1989). In this study, as well as in successive entrainment monitoring studies at Bowline, the dominant life stage of entrained bay anchovy was post-yolk sac larvae. Bay anchovy eggs typically peak in entrainment samples from Haverstraw Bay in late June - mid July. Very few yolk sac anchovy larvae are observed in entrainment collections, as this life stage only lasts 12-

18 hours. Post-yolk sac anchovy larvae are entrained from late June - late August. Juvenile anchovies are primarily entrained in August (Mirant Bowline LLC 2003). Additional species collected as egg, yolk sac, or post-yolk sac life stages, albeit in relatively low densities, included winter flounder, windowpane flounder, and bluefish. Post-yolk sac and juvenile striped bass larvae were the next most abundant taxon/life stage observed in the 1987 entrainment study.

Striped bass have historically not been entrained as eggs at Bowline; this reflects the distance of the plant from their upriver spawning grounds. However, by the time striped bass have reached the post-yolk sac larval stage, they have drifted downriver and are susceptible to entrainment at Bowline, primarily during the month of June. Juvenile striped bass have historically been entrained during July. White perch early life stage distribution is similar to that of striped bass, although there is a slightly more upriver bias to their distribution in the Hudson during mid-summer (Mirant Bowline LLC 2003).

Alosids spawn further upriver than striped bass/white perch and entrainment of significant numbers of eggs or larvae in Haverstraw Bay reflects either unusually high flow events resulting in downstream transport of eggs/larvae, or an atypical downriver spawning concentration in some years. Historically, alosids have only been entrained in low numbers in mid-May (eggs) or late May – early June (yolk sac and post yolk sac larvae).

In an impingement study conducted at the Lovett Generating Station in 1979, an estimated total of 90,021 fish were impinged during a one-year period. Highest rates of impingement occurred during November and December, and the dominant species impinged was white perch (64 percent of total). Additional numerical dominants included Atlantic tomcod, bay anchovy, blueback herring, gizzard shad, and spottail shiner (LMS 1980). Impingement collections from 1996-1999 were dominated by bluefish, although total impingement numbers were relatively low, overall, during this period. Additional species impinged during this time included red hake (*Urophycis chuss*), winter flounder, windowpane flounder summer flounder, and Atlantic butterfish (*Peprilus triacanthus*) (Normandeau Associates 1997b; 1998; 2002).

Bay anchovy dominated entrainment collections at Lovett in 1997 by several orders of magnitude. Entrained anchovy were approximately equally distributed among -egg, post-yolk sac larvae and juvenile life stages. A total of 50 post yolk larvae and 17 juvenile striped bass larvae, were also entrained, along with a single juvenile bluefish, during this study (EA 1998).

<u>Hudson River - Commercial and Recreational Species</u>

Commercial fishermen in the eighteenth and nineteenth centuries harvested a wide variety of finfish species from the Hudson River. Among the species most heavily exploited were American shad, Atlantic sturgeon, and striped bass. Atlantic sturgeon was valued for both their roe and flesh, while shad would be taken in great numbers during the spring spawning run and salted for later consumption. Striped bass was abundant and could be found throughout the harbors, East and Harlem Rivers, and up the Hudson River as far up as Stony Point (Waldman et al. 2006). As a result of widespread PCB contamination in the Hudson River, several of the important commercial fisheries are closed today and commercial fisheries effort is at an all-time low for that area (Waldman et al. 2006). The section below describes recent trends and status of the major commercial fishery species in the Hudson River.

Striped Bass

Prior to 1982, few restrictions were in place for taking of striped bass in state and coastal marine waters. With the collapse of the Chesapeake Bay striped bass stock in the mid-1970s, the Emergency Striped Bass Act was passed in 1979 and the first striped bass fisheries management plan was developed in 1981. Marine commercial harvest were limited by severely reduce quotas to less than 20 percent and harvest season, size limits, and allowable gears were also enforced. That combined with regulations on size, bag limit, and season of the recreational striped bass fisheries lead to the rebound of this species where they return to the rivers to spawn, production estimates were up, and adult age structure was stabilized (Waldman et al. 2006).

Atlantic Sturgeon

A small Atlantic sturgeon fishery persisted in the Hudson River through the 1980s, made up of a small group of fishermen taking a few fish each year for their caviar and meat. Due to the restrictions of the striped bass management along the Atlantic coast, the Atlantic sturgeon became targets by fishermen to make up for lost income. Few Atlantic sturgeons were surviving to return to the Hudson River, since the commercial fishery shifted to targeting spawning adults. By 1997, New York's stock assessment showed harvest and fishing rates were severely over the limit that the population could handle. By 1998, the entire United States Atlantic Coast was closed for Atlantic sturgeon harvest and the interstate management plan set a 40-year time limit for the coast-wide moratorium based on the life history of the animal (Waldman et al. 2006).

American Shad

The Hudson River American shad population has gone through collapse and re-growth cycles several times over the past century. The CWA of 1972 prevented sewage dumping and the Hudson River slowly started to clear up, along with re-gaining its fisheries through the 1980s. Just as the case with Atlantic sturgeon, the recovery effort for striped bass caused a shift in fishermen focus to American shad. Starting in 1991, the Hudson River American shad stock began to decline, showing classic signs of over-fishing. American shad are smaller at any given age, and fewer older shad are returning to spawn (Waldman et al. 2006). To address this concern, the Hudson River American Shad Recovery Plan is being implemented to maintain monitoring programs, reduce mortality, reduce bycatch, characterize and restore critical spawning and nursery habitat, undertake ecosystem studies, and ultimately restore American shad abundance to historical levels (Kahnle and Hattala 2010). The commercial and sport fishery for the American shad is currently closed.

Recreational Fishing

The NYSDOH conducted a Hudson River angler survey in 1996. The survey included 172 miles of the Hudson River from Hudson Falls to the Tappan Zee Bridge at Tarrytown. A similar angling survey was conducted between 1991 and 1992, but was limited to within the New York City area. In both surveys, the most important finfish species caught by anglers were white perch, striped bass, white catfish, and American eel. Finfish species kept by anglers were white perch, white catfish, striped bass, carp, largemouth and smallmouth bass, bluefish, and American eel (NYSDOH 1996). Table 7-8 lists the finfish species caught by anglers during the 1991-1992 and 1996 angler surveys.

With the Hudson River water quality returning to levels not seen for many decades, the striped bass population continued to increase, and angling in the length of the tidal river grew in popularity. The area below the federal dam has become especially attractive for recreational fishermen that target striped bass and other anadromous fish species that aggregate there in large numbers (Waldman et al. 2006). The striped bass fishery in the Hudson River and New York Harbor has now become so popular that several, mainly springtime charter boat operations were launched and annual tournaments are now being held (Waldman et al. 2006).

Another fishery in the Hudson River that supports charter boats and tournaments are black basses (largemouth and smallmouth bass). These species occur in the freshwater and low salinity reaches of the Hudson River. Recruitment in the Hudson River is low but growth is rapid, the fastest in New York State (Waldman et al. 2006). The American shad population in the Hudson River has rebounded which has stimulated a new sport fishery. Anglers have learned that in addition to aggregating below the federal dam, American shad can also be found by targeting particular types of habitat and tidal stages throughout much of the tidal freshwater portion of the Hudson River (Waldman et al. 2006).

7.2.1.3 East River

A number of fish composition studies have been conducted throughout the length of the East River between 1982 and 1987. Several of these studies consisted of year-long monthly sampling efforts in support of a variety of waterfront development projects; Riverwalk Studies, Hunters Point, and East River Landing Area (LMS 1985; LMS 1986; Parish and Weiner 1987). However, due to the strong tidal currents in the East River and the difficulties of maintaining effective and proper gear deployment under that condition, the overall fish data in the East River is limited. All of the studies conducted between 1983 and 1987 yielded similar results, as many as 57 species were collected with winter flounder, Atlantic tomcod, striped bass, and grubby representing the dominant species.

The fish occurring in the East River are part of the larger community inhabiting the lower Hudson River Estuary and also of the community inhabiting the western reaches of the Long Island Sound. More than 50 species of fish have been recorded in the East River, with marine species comprising approximately 70 percent of the total number, and estuarine and migratory species each comprising approximately 15 percent of the rest of the species (Woodhead 1993). Nearly all of the species occurring in the East River are found in both the Hudson River Estuary and Long Island Sound. The dominant fish species in the East River are the same as those in the neighboring waterbodies, and the species distribution among different ecological groups is also similar (Woodhead 1993).

East River - Ichthyoplankton Seasonal Cycles

Entrainment studies were conducted for the Ravenswood Generating Station from September 1991 to September 1992 and from February 1993 to January 1994. For the 1991 to 1992 survey period, a total of 24 species and four composite taxa (such as family level identification) were identified. A combined total of 11,311 fish eggs and larvae, plus an additional 132 juveniles were collected and when scaled to operating volume, a total of approximately 181.4 million fish eggs and larvae were estimated to have been entrained (LMS 1993). For the 1993 to 1994 survey period, a total of 30 species and five composite taxa were identified. A combined total of 25,236 fish eggs and larvae and 288 juveniles were collected and when scaled to operating volume, a total of approximately 256.4 million fish eggs and larvae plus 2 million juveniles were estimated to have been entrained. Total species diversity for both years combined was 35 species plus eight composite taxa (LMS 1994). Many of the differences between years is explained by low numbers of rare species, year class strength, or that the East River is on the edge of range for early life stages of some species. Significantly more ichthyoplankton were estimated to be entrained in 1993 to 1994 compared to the 1991 to 1992 sample year, 256.4 million fish eggs and larvae compared to 181.4 million. However, the dominant species present were similar for both years with 7 out of 10 species dominant both years.

In 1993, most of the eggs collected from February through August with the large peak in April. Fourbeard rockling comprised 64.3 percent of the eggs and 39 percent of all life stages combined, while winter flounder eggs were the second most abundant in 1993 (19.6 percent), collected from February to May. Larval life stages were collected from July through early October, peaking in April, May and August in 1991-1992 and April, July, and September in 1993. Larval life stages were dominated by grubby, collected from February to May, and bay anchovy, collected from June through October but peaking from July to September (LMS 1994).

7.2.2 Avoidance and/or Minimization of Potential Impacts

The construction of the proposed HVDC Transmission System has the potential to cause temporary, localized impacts on benthic habitats, as well as on benthic prey organisms. However, within Lake Champlain, the Hudson River, Harlem River and East River, the impacted areas represent a small fraction of the bottom. Benthic feeding fish are expected to feed in surrounding, unaffected areas, including extensive benthic habitat adjacent to the construction corridor. Therefore, any impacts will be insignificant due to the temporary, localized and overall limited reductions in available benthic food sources. In addition, recruitment and re-colonization of the benthic infaunal communities is expected to occur following construction since soft bottom benthic species have adapted to naturally occurring bottom disturbances, through reproductive mechanisms involving planktonic larval recruitment. Studies conducted on offshore sand borrow areas off the outer New Jersey coast indicated that benthic communities were re-established within 8 to 9 months, i.e., within one annual recruitment period after dredging (USACE 1999).

Further, because fish species in the HVDC Transmission System area are mobile, and given the narrow construction corridor, bottom feeding finfish are likely to temporarily relocate to adjacent areas unaffected by construction. Any pelagic piscivorous (fish feeding) species are likely to leave the immediate construction area because of the noise and small suspended sediment plumes, but will resume feeding in the cable route as soon as the installation vessel leaves and forage on fish that re-occupy the construction area. The Applicants have worked closely with state agencies to establish a construction window to avoid and/or minimize potential impacts to fish species.

The construction activities along the underwater cable route may have a short-term benefit to some fish species. Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the Lower Bay of New York Harbor and found that during dredging, and immediately after an area has been dredged, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Within the marine portions of the cable route, species that may be attracted to feed during and after cable installation will be mostly juvenile and adult stages of flounders, skates, and opportunistic species (e.g., striped bass) that can avoid the construction activities.

In areas where conventional dredging is employed, typically for deeper burial areas such as at crossings of a navigation channel, construction will involve sediment removal, cable-laying, and then backfilling. Depending on the nature of the backfill, the sediment surface characteristics could be altered since it is unlikely that exactly the same grain size composition will be created as existed prior to cable installation. Depending on currents and erosional forces, backfill will be used that is anticipated to remain in place. However, whatever the backfill characteristics are, they are likely to become colonized over time with benthic organisms. Given the small amount of anticipated conventional dredging, any altered prey abundance or modified substrate characteristics should have an insignificant impact on fish species.

Construction activity may include the placement of rip-rap or concrete mats along the cable route, which could result in the mortality of benthic biota and other immobile or slow-moving benthic organisms located in the immediate area of placement. Given the anticipated short segments where rip-rap or concrete mats will be placed (primarily foreign utility crossings), this alteration represents an insignificant loss of soft bottom benthic habitat and associated benthic species. In addition, the rip-rap or concrete mats will provide additional new hard bottom habitat for epibenthic organisms to colonize, essentially functioning as small patch reefs. In these areas, the rip-rap or concrete mats will provide areas of shelter, structure, or cover typically sought by some fish species such as rock bass in the Hudson River (Johnson and Stickney 1989; Ogden 2005).

In addition to the benthic disturbance, underwater cable installation may result in temporary and localized increases in suspended sediments, which could potentially lead to gill abrasion and impaired respiration of fish species in or adjacent to the underwater cable route. Turbidity may also temporarily impact the predation efficiency of sight feeding fish in or adjacent to the cable route during installation. However, any suspended sediments from construction activities are expected to settle quickly out of the water column or be dispersed by the flow of the river and tidal currents along the cable route and related turbidity will be similarly and temporally limited. Thus, any potential impacts to fish species in or adjacent to the cable route are expected to be insignificant. In areas where deposition of suspended sediments could impact demersal fish eggs it may be possible to avoid construction during the early spring, which would avoid and/or minimize the potential impacts associated with sediments covering these eggs.

In the Hudson River, a number of anadromous fish species make seasonal movements up and down the River. At certain times of the year (primarily spring and fall), extensive areas of elevated suspended sediments would have the potential to impact their movements. If suspended sediment is highly concentrated, the anadromous fish species may not attempt to pass through these areas of the water column. However, water jetting generally creates only localized increases in turbidity, often restricted to near bottom areas of the water column. Given the depth and width of the Hudson River, and the localized and temporal nature of any sediment suspension, no impact to of fish migrations from suspended sediments in the water column is expected during cable installation.

During the installation of the cables, a number of vessels, including tugs, barges, cranes, and workboats may be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials which theoretically have the potential to be accidentally released to the water. BMPs and an SPCC Plan, or its equivalent, will be employed throughout construction and spill response procedures will be implemented in the case of a spill to avoid and/or minimize any impacts from potential oil and fluid spills. With proper training and procedures implemented, the possibility of a spill is remote.

In order to avoid the river reach associated with the Upper Hudson River PCB Dredging Project, the underground cable route will exit Lake Champlain (via HDD techniques) and follow an on-land railroad right-of-way bypass route before entering the Hudson River south of Albany (see Figure 1-1 for the route). Bypassing this portion of the Hudson River will avoid and/or minimize the potential for resuspending sediments with higher levels of PCBs, thereby avoiding and/or minimizing the potential for bioavailability to fish.

Cable installation in the water will occur on a continuous basis, which will require nighttime lighting on the construction vessels. Some species of fish are attracted to light at night, while other species avoid illuminated areas. Fish that are attracted to the lighted areas may enter areas of increased suspended sediments resulting from the jetting. Impacts due to this behavior will be avoided and/or minimized by the separation distance between the water jetting device on the bottom and the illumination at the surface. In addition, most fish will avoid areas around the water jetting device and vessels due to elevated noise levels, which may minimize any light attraction behaviors exhibited by fish.

With use of HDDs at shoreline crossings, there is a chance of an inadvertent release of drilling fluid into water bodies. Depending on currents or wave action, some of the deposited drilling fluid could become suspended and/or dispersed. Drilling fluid, composed primarily of bentonite clay and water, if suspended, may have similar impacts on fish respiration and feeding as those described above for jetting induced suspended sediments. Drilling fluid is recognized as non-toxic by the EPA, and in the event that drilling fluid additives are necessary, none will be used that have toxic effects.

During operation of the Facility, the cables will produce EMF and generate heat which is dissipated into sediments. The potential impacts of these are described below.

7.2.2.1 Thermal Effects

The cables will produce heat during operation, whose dissipation will be a function of various parameters including burial depth, thermal characteristics of the sediments and other factors. The low rate of steady-state energy dissipation from the installed electric cables would have an insignificant impact on water temperatures in Lake Champlain, the Hudson River, Harlem River and East River given the large mass of water and circulation associated with these waterbodies. Any changes to ambient water temperature would be insignificant and localized to the area directly adjacent to the cable. Therefore, there should be no impact on fish.

In order to better understand the potential impacts of thermal effects for the Hudson River, a detailed analysis of the heating by the proposed cable installation was performed by Exponent. This analysis, discussed below, examined likely changes in water and sediment temperature, as well as likely impacts on sensitive fisheries within the river.

Water Temperature

The average flow rate of water in the Hudson River is 13,600 cubic feet per second, but it can flow as slowly as 882 cubic feet per second[6]. The energy loss from the cable in the form of heat that would be required to heat water moving at the average flow rate of the Hudson River by just 1 degree Celsius (C) is 6,000 Watts/meter (W/m) assuming a 150-mile cable length. Even at the minimum water flow of 882 cubic feet per second, a 1 degree C temperature increase would require a cable loss of 430 W/m[7]. The typical anticipated cable loss when the transmission line is in operation is 86.2 W/m (43.1 W/m per cable for two cables). Thus, the heat from the cable will have an insignificant, perhaps even immeasurable, effect on water temperature anywhere along the length of the proposed cable installation and any water quality or biological effects in the water column would similarly be insignificant.

Further, one can compare the water heating due to the cable heat loss to the heating of the river by the energy from the sun. Solar energy deposited on the surface of the earth is approximately 3.7 kW-h/m^2 per day, with daily variation (standard deviation) of 2.2 kW-h/m^2 (Worzyk 2009). In the narrowest section of the Hudson River (992 feet), this produces average heating of 46,614 W/m with daily variation of 27,716 W/m; wider sections of the river will have a higher equivalent heating. The daily variation in the sun's heating is 321 times higher than the heating due to the proposed buried cables. The fluctuation in the sun's heat to the Hudson River over just one day is almost equivalent to a whole-year of heat loss from the installed cables. Hence, in any one day the heat input from the cable would be lost in the natural variability due to seasonal changes in length of daylight, meteorological conditions, and turbidity levels, and hence would have no water quality or biological impacts within the water column.

6 National Water Quality Assessment Program - The Hudson River Basin, http://ny.water.usgs.gov/projects/hdsn/fctsht/su.html
7 All the calculations assume that water had a chance to mix at least once in its travel along 150 miles of the river.

Sediment Temperature

Exponent performed two finite volume calculations of the temperature rise in the sediment below the seafloor surface. The first model included two cables with heat losses of 43.1 W/m each, separated by 1.8 meters at cable burial depths of 6 feet, the current configuration of the HVDC Transmission System. Simulations were performed for three common sediment types: sand, clay, and gravel. The simulation was conservative in that it assumed that moving water provides no forced convection cooling of the seafloor sediment, only natural (i.e., standing water) convection and conduction of the sediment was included. In reality, moving water increases convection by assisting in the movement of heat out of the soil into the overlying water layer, which then passes away from the heat source by flow induced by the river gradient as well as tides or density changes. The results are shown in Table 7-9 and Figure 7-.2

Exponent updated their model to provide the maximum temperature change associated with having the cables touching. This model assumed a burial depth of four feet in a clay/silt sediment. The results are shown in Table 7-10 and Figure 7-3.

Many different authorities use 2°K increase or its equivalent a 2°C increase at 0.2 and 0.3 meter burial depth as a measure of cable induced heating. For all burial depth and sediment types at a six-foot burial and six foot separation, the width of sediment which exceeds 2°K increase in temperature is less than 6 meters (18 feet) at depth of 0.2 and 0.3 meters below the seafloor surface. For a four-foot burial with no separation, the width of sediment which exceeds 2°K increase in temperature is approximately 3 meters (9.8 feet) at depth of 0.2 and approximately 3.8 meter (12.5 feet) at 0.3 meters below the seafloor surface. The seafloor surface temperature calculated for both models greatly overestimates the actual temperature rise due to the conservative assumptions of the model. Actual temperature rise on the seafloor surface is going to be by a far lower amount given the conservative assumption of non-flowing water. This model is more accurate, however, for the 0.2m and 0.3m depth calculations because the conservative assumption has less influence on the heat movement in the shallow subsurface sediment than at the sediment-water interface.

Thermal Impacts to Fisheries

Published calculations of the temperature effects of operating cables are consistent in their predictions of significant temperature rise in the vicinity of the cables (OSPAR Commission 2009). The underwater cable buried below the seabed would not pose a physical barrier to fish passage, and would allow benthic organisms to colonize and demersal fish species (including demersal eggs and larvae) to utilize surface sediments without being affected by the cable operation (Mineral Management Service 2008). The small increase in seabed temperature is considered to be within normal ranges of variation and no residual effects are predicted. The potential for increases in seawater temperature above these areas is negligible and impacts will be insignificant (Shetland HVDC Connection 2009).

Specifically, the temperature requirement of river herring (alewife and blueback herring) eggs is between 7 to 29.5 degree Celsius (°C), with the optimum temperature preference at 18°C. In the

Hudson River, the upper lethal temperature limit for eggs is 29.7°C. The upper lethal temperature in the Hudson River acclimated to 14°C was 31°C (Mullen et al. 1986).

Atlantic sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces (e.g., cobble). Hatching occurs approximately 94-140 hours after egg deposition at temperatures of 20°C and 18°C, respectively, and larvae assume a demersal existence (Gilbert 1989; Atlantic Sturgeon Status Review Team 2007). There is no information on survival of eggs or early life stages of shortnose sturgeon in the wild. Many eggs reared in captivity die of fungus infections. However, spawning in freshwater typically occurs when water temperature increase to 8-9°C and ceases when water temperature reach 12-15°C. Spawning in the Connecticut River has been observed to occur at 18°C (National Marine Fisheries Service 1998).

Hatching of white perch occurs in 24 hours at 16°C to 20°C and in 144 hours at 11 to 16°C. Optimum hatching temperature was 14°C at a salinity of 0 parts per thousand (ppt). The size of newly hatched larvae was related to temperature; the maximum length occurred at 16 to 18°C at all salinities (0 to 10 ppt) (Stanley and Danie 1983).

The estimated peak temperature rise at the seafloor surface for the 6 feet cable burial and 6-foot separation ranges between 0.9 to 1.7°C while with the cables touching at a burial depth of 4 foot the calculated maximum temperature rise will be 1°C. However, these estimated rise in seafloor surface temperature are an overestimation of the natural condition as it does not taken into account the cooling effect from the natural flowing of the Hudson River. The potential rise in temperature of the seafloor surface will be within the preferred temperature limits of the demeral eggs and larvae species that utilizes the bottom habitat of the Hudson River Estuary and, therefore, will have no impact.

7.2.2.2 Electromagnetic Field

During Facility operation, the cables will produce electromagnetic field (EMF). The Applicants retained Exponent Inc. to provide the estimates of magnetic field levels increases associated with installing the cables vertically within the same trench to a planned depth of six feet, which is the current anticipated installation methodology (see Joint Proposal Exhibit 100 for this study as well as Joint Proposal Exhibits 91 and 92 for additional background information). When the cables are laid vertically into a single trench, the maximum magnetic field deviation from background magnetic field if the cables are in a north/south orientation is 26.2 mG at ten (10) feet from the centerline at one foot above the riverbed or lakebed. If the modeling is performed under the assumption that the top cable may “slide” off of the other so that the cables were horizontal (i.e., side-by-side), the maximum deviation from the background magnetic field is 83.5 mG at a height of one foot above the riverbed directly over the centerline. Under both configurations, magnetic field levels continue to drop with distance from the centerline.

The spatial relationship of the zone of influence of the cables to the overall habitat available is an important factor in assessing the potential for impacts. The location of the zone of influence on the bottom prevents the potential exposure of many species that utilize shoreline and shallow water habitats. The cable centerline was intentionally sited in moderately deep to deep water to avoid shallows. Those species which utilize bottom habitats in deep water would potentially have greater exposure to the zone of influence than other species. Many other species utilize the bottom for feeding, particularly in juvenile life stages, but this occurs primarily in shallow water. The eggs of many species are spawned on the bottom or deposited on the bottom after spawning in the water column but many of these species spawn over shallow water depths. The following sections address the specific activities of migration, spawning, feeding, and early developmental stages of fish.

Migration

Migration generally refers to the movement of large numbers of individuals moving in unison to a selected, preferred location, often for spawning. For this assessment many types of movements by large segments of the fish populations are included because any significant movement patterns could bring individuals within the zone of influence of the cables. Migrations and major movements follow a seasonal pattern thus migrating individuals will only be exposed to the potential influence of the cables on a temporary basis. Non-migratory species in the Hudson with a preferred, deep-water habitat may be exposed to the potential influence of the cables year round.

Based on the spatial distribution of the magnetic fields, it is apparent that only a small portion of any migrating fish population would come in contact with the zone of influence of the cables. The cables are aligned generally, parallel to the axis of the river, thus migrating fish could travel the full length of the Hudson without encountering the influence of the cables, even where the cables cross federal maintained navigation channels. Fish would encounter the cables' influence only if they were migrating near the bottom and then only if they were aligned with the small zone of influence. Assuming a 526.5 mG geomagnetic field on the riverbed, the model analyses show that for the vertical configuration there is very little change in total magnetic field (5.0%) at 1 ft. above the river bottom when the cables buried at a depth of 6 ft. This zone of influence diminishes at 10 ft. above the riverbed in the water column to a 2% change in the background magnetic field.

For fish that enter the zone of influence around the cables, the potential for impact depends on whether or not the individuals could detect the induced changes and how they respond to the changes. There is technical literature that shows that some fish species can detect and use magnetic fields for navigation. This has been reported and studied with respect to Pacific and Atlantic salmon (Mann et al. 1988; Walker et al. 1988; Scottish Executive 2007; Yano et al. 1997; and Quinn and Brannon 1982). These studies did not detect an effect on fish behavior when magnetic fields around the fish were artificially altered. The lack of an effect may be due to the low level of induced change and the fact that the migrating fish are responding to a variety of stimuli. As there are no apparent impacts on individual fish, this eliminates the potential for population level effects. The Hudson River is a highly developed estuary which contains many stimuli that could potentially impact fish migration. In their study of the Cape Wind project, the USACE (2004) concluded that there would be no negative effects to fish species or the marine environment as a result of the 60 Hz B fields because the magnitude of the B fields proximal to the transmission cable would be limited to an extremely small space and decrease rapidly within a few feet of the cable.

In addition, a second important consideration is that, by and large, migrating fish species will not travel in the part of the water column closest to the buried cable. The strength of the field is greatest closest to the cable and diminishes quickly with distance. As migrating fish species tend to be in the upper part of the water column (see Xie 2002) and the cables will only be installed in an area where the depth is greater than 20 feet, the additional distance above the buried cables brings them into a region where the magnetic field characteristics will be closer to that of the earth's background geomagnetic field than at the river bottom. This separation distance diminishes the potential for impacts on fish migration. Therefore, there is no evidence that fish migrations in the Hudson River have been or would be impacted by magnetic fields.

Spawning

As there are no impacts on fish migrations, species utilizing the Hudson for spawning, including resident species, will be able to freely access their preferred areas for spawning. The majority of fish species spawn in tributaries, shallow shoreline areas, and in open water in the pelagic zone. All of these areas are beyond the influence of the operating cables. The narrow zone of influence from cable operation provides a very large area of bottom habitat that is not influenced by the cables. See section on early life history development below.

Feeding

As with other aspects of potential cable effects, any impact on feeding behavior would be insignificant and limited to localized areas of river bottom influenced by the operating cables. Fish feeding in shallow, shoreline areas of the river or in the pelagic zone would not be influenced by cable operation. Bottom feeding fish could move into and out of the zone of influence as they move in the search for food.

Sturgeon may use AC electronic signals emitted by prey to guide them to the prey (Basov 1999), but such electric fields will not be produced by the proposed cables. Altered magnetic fields will be present in small, localized areas as described above, but there is no evidence that these fields are a factor in the feeding behavior of sturgeon. A study of the invertebrate community in the Baltic Sea in the vicinity of a new submarine cable and at control stations found no changes in the species composition, abundance, or biomass of invertebrates (Andrulewicz et al. 2003). In addition, based on the post-installation benthic survey conducted for the Neptune Regional transmission project the benthic community re-colonized the cable installation areas within several months of installation (Neptune 2009). Therefore, feeding opportunities for fish will be not impacted.

Life Stage Development

The potential exposure of early life stages to the cables will vary depending on their habitat preferences and movement patterns. The life stage with the greatest potential for exposure would be fish eggs and newly hatched larvae that settle to the bottom habitat that is within the zone of influence of the operating cables. At this time they are undergoing rapid physiological and anatomical changes.

A number of studies have investigated the effect of strong magnetic fields on fish egg and larval development. The magnetic fields in these studies were much greater than the changes in natural magnetic fields anticipated by the operation of the proposed transmission cables. Strand et al. (1983) reported that exposure of rainbow trout eggs, sperm, or fertilized eggs to a 1 Tesla (10,000 Gauss [G] or 1,000,000 milligauss [mG]) direct current (DC) magnetic field had only the slightest effect of the fertilization rate. Formicki and Winnicki (1998) reported that rainbow trout embryos and larvae exposed to DC magnetic fields above 4 millitesla (mT) (40 G or 40,000 mG) exhibited incubation delays and longer heavier bodies than controls exposed at levels up to 5.5 mT.

A weak increase in the permeability of egg shells in trout, rainbow trout, and sea trout to water was reported from ultrastructural observations of the shells after exposure to a 2 mT (20 G or 20,000 mG) DC magnetic field in vitro (Sadowski et al. 2007). Sea urchins exposure to 30 mT (30 G or 30,000 mG) but not 15 mT (15 G or 15,000 mG) DC magnetic fields delayed development in early embryos and caused increase in abnormalities of gut development (Levin and Ernst 1997). Sudden exposure of carp embryos and larvae to DC magnetic fields of 50-70 mT (500-700 G or 500,000-700,000 mG) is reported to increase heart rate by 5 %, which then declined to resting levels in 15 minutes (Formicki and Winnicki 1996). Trout larvae and fry tended to be attracted to magnets placed in experimental mazes that produced magnetic fields of 0.15-0.42 mT (1.5-4.2 G or 1,500-4,200 mG).

These studies show that much stronger magnetic fields than will be produced by the proposed HVDC Transmission System are needed to impact the early life stages of aquatic organisms. As shown in the model, the change in magnetic field produced by the proposed cables are equal to or less than 30.3 mG, which is about 10-100 times lower than the magnetic field levels that are reported to produce adverse effects in the early life stages of fish that remain in the zone of influence for an extended period of time. Therefore, early life stages of fish will not be impacted.

Older, mobile life stages of fish from early juveniles to adults would not be exposed to these low levels of magnetic fields for extended periods. After cable installation is completed the impacted area of the bottom is expected to recover its benthic invertebrate community. After the cable is energized, the benthic community is expected to be similar to that from adjacent benthic area. Sturgeon and other species are expected to distribute themselves throughout the Hudson Estuary as they did prior to cable installation and have only incidental contact with the zone of influence of the cables.

7.2.2.3 Summary of Potential Impacts on Aquatic Life

Modeling analysis shows that the increase in sediment temperature, as well as changes in the natural magnetic fields would be insignificant and limited to localized areas of influence confined to the river bottom and the water column directly above the cable centerline. The potential change in water temperature is insignificant, probably not detectable, while the sediment surface temperature is elevated by 1ºC for the proposed burial depths. This analysis is conservative in that it is based on an assumption of a clay/silt substrate. With regard to magnetic field, the model analyses show that a 6-foot burial depth produces an appreciable change in total magnetic field up to 25 ft. from the cable centerline depending on the arrangement of the two cables. The magnitude of the change diminishes rapidly beyond 10 feet from the centerline.

The available information on the effects of alterations in water and sediment temperature, and changes in the magnetic field on aquatic life shows that potential impacts to fish species, if any, are expected to be insignificant for individual organisms and for various biological functions including migration, spawning, feeding and life stage development. The technical literature is not specific to species in the Hudson, but it does cover a range of related organisms. Both species-specific studies as well as reviews of literature reveal only insignificant impacts from the operation of submarine electric cables. Given this lack of evidence of impacts, the low level of induced changes by the proposed cables and the small spatial extent of these changes, the HVDC Transmission System is anticipated to have an insignificant impact on any fish species present during its operation.

7.3 Essential Fish Habitat

7.3.1 Existing Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth several new mandates for the United States Department of Commerce (USDOC) NOAA, National Marine Fisheries Service (NMFS), Regional Fishery Management Councils (Councils), and other federal agencies to identify, protect, and conserve the habitat of important marine, estuarine, and anadromous finfish as well as certain mollusks and crustaceans. Although the concept of essential fish habitat (EFH) is similar to "critical habitat" under the Endangered Species Act of 1973, measures recommended to protect EFH are advisory, rather than prescriptive (NOAA 2009a).

The Councils, with assistance from NMFS, are required to delineate "essential fish habitat" for all managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growing to maturity" (NOAA 2009a). The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; and, areas used for spawning, breeding, feeding and growth to maturity" to cover a species' full life cycle. Prey species are defined as being a food source for one or more designated fish species, and the presence of adequate prey is one of the biological properties that can make a habitat essential (NOAA 2009a).

The EFH assessment provided in this section is a summary of the EFH-designated species and life history stages listed in the 10-minute by 10-minute area of latitude and longitude waters along the Atlantic coast of NOAA's Guide to EFH Designations in the Northeast United States (Figure 7-4). The full EFH assessment will be completed in coordination with NMFS and adjoining state agencies along the proposed cable route.

7.3.1.1 Hudson River

The EFH designated species and life history stages in the Hudson River are represented by species in the Hudson River/Raritan/Sandy Hook Bays as part of the EFH designation for major estuaries, bays, and rivers along the northeast United States coast. EFH designated species in the Hudson River are also included in NOAA's 10-minute by 10-minute square encompassing Atlantic Ocean waters from the Hudson River and Bay down through the New York/New Jersey Harbor areas (NOAA 2009a). The compiled NOAA data also include EFH designated skate species in the New York Bight region of the Atlantic waters (NOAA 2009a). A total of 13 finfish, two sharks, and three skates are currently designated as EFH species within the waters of the Hudson River. Each EFH designated species and the corresponding designated life stages are presented in Table 7-11.

A brief species description of EFH designated species in the Hudson River is provided below.

Atlantic Sea Herring

Adult Atlantic sea herring migrate south into southern New England and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals. Juvenile and adult herring are abundant in coastal and mid-shelf waters from southern New England to Cape Hatteras in the winter and spring. In the spring, adults return north, but juveniles do not undertake coastal migrations. Larval herring are limited almost exclusively to Georges Bank and the Gulf of Maine waters. Larvae typically metamorphose the following spring into YOY juveniles. In the Hudson-Raritan Estuary (HRE), Atlantic herring prefer water depths greater than -25 feet MLW. Atlantic herring in the New York Bight generally prefer water depths greater than -60 feet MLW (Stevenson and Scott 2005).

Bluefish

Bluefish spawn offshore in open ocean waters. Eggs in the Mid-Atlantic Bight are generally collected between April through August in temperatures greater than 18 °C and normal shelf salinities (greater than 31 ppt). Larvae distribution is similar to eggs in preference of water temperature (greater than 18°C) and salinity (greater than 30 ppt), and are typically collected between April through September. Juveniles move inshore in early- to mid-June, arriving when temperatures reach approximately 20°C. Juvenile bluefish are found in estuaries, bays, and coastal ocean waters in the Mid-Atlantic Bight and South Atlantic Bight in many habitats. Typically they are found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fishes, which are commonly found in nearshore habitats. They remain inshore in water temperatures up to 30°C and return to the continental shelf in the fall when water temperatures reach approximately 15°C. Juvenile bluefish are associated mostly with sand, but are also found over silt and clay bottom substrates. They usually occur at salinities of 23 to 33 ppt, but can tolerate salinities as low as 3 ppt. Adults are generally oceanic but are found near shore as well as offshore. Adults usually prefer warm water (at least 14 to 16°C) and full salinity (Fahay et al. 1999).

Atlantic Butterfish

Butterfish are fast-growing, short-lived, pelagic fish that form loose schools, often near the surface. Juveniles and adults are common in inshore areas, including the surf zone, and occur in sheltered bays and estuaries in the Mid-Atlantic Bight during the summer and fall. Juveniles and adults are eurythermal and euryhaline, and are frequently found over sand, mud, and mixed substrates. Smaller juveniles often aggregate under floating objects. Juvenile and adult butterfish in the HRE are typically found at depths ranging from -10 to -75 feet MLW with water temperatures ranging from 8 to 26°C, salinities ranging from 19 to 32 ppt, and dissolved oxygen ranging from 3 to 10 milligram per liter (mg/l) (Cross et al. 1999).

Scup

Scup spawn along the inner continental shelf from Delaware Bay to southern New England between May and August, mainly in bays and sounds in and near southern New England. Scup spawn in the HRE during July. YOY juveniles are commonly found from the intertidal zone to depths of about -100 feet MLW in portions of bays and estuaries where salinities are above 15 ppt. Juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eelgrass beds. Adults move inshore during early May and June between Long Island and Delaware Bay. Adults are found inside bays and sounds, but like juveniles, do not penetrate low salinity areas. Adults are often observed or caught over soft, sandy bottoms and in or near structured habitats, such as, rocky ledges, wrecks, artificial reefs, and mussel beds. Adults move offshore once water temperatures fall below 7.5 to 10°C in the fall (Steimle et al. 1999a).

Black Sea Bass

Black sea bass are usually strongly associated with structured, sheltering habitats such as reefs and wrecks. Spawning occurs on the continental shelf, beginning in the spring off Cape Hatteras and progressing into the fall in the New York Bight and off southern New England. When larvae reach 10 to 16 mm total length, they tend to settle and become demersal on structured inshore habitat such as sponge beds. In the Mid-Atlantic Bight, recently settled juveniles move into coastal estuarine nursery areas between July and September. The estuarine nursery habitat of YOY black sea bass is relatively shallow, hard bottom with some kind of natural or man-made structure including amphipod tubes, eelgrass, sponges, and shellfish beds with salinities above 8 ppt. Black sea bass do not tolerate cold inshore winter conditions. Following an overwintering period presumably spent on the continental shelf, older juveniles return to inshore estuaries in late spring and early summer. They are uncommon in open, unvegetated, sandy intertidal flats or beaches. Like juveniles, adult sea bass are very structure oriented, especially during their summer coastal residency. Unlike juveniles, adults only enter larger estuaries and are most abundant along the outer Atlantic coast. Larger fish tend to be found in deeper water than smaller fish (Steimle et al. 1999b).

Red Hake

Red hake spawn offshore in the Mid-Atlantic Bight in the summer, primarily in southern New England. The distribution of eggs is unknown because they cannot be distinguished from other hakes. Larvae dominate the summer ichthyoplankton in the Mid-Atlantic Bight and are most abundant on the mid-and outer continental shelf. Larvae are transported into coastal waters and settle to the bottom in the fall. Juveniles seek shelter and commonly associate with scallops, surf clam shells, and seabed depressions. Juveniles and adults make seasonal migrations in response to changes in water temperatures. In the Mid-Atlantic Bight, red hake are commonly found in coastal waters in the spring and fall and move offshore or into deeper inshore water to avoid warm, summer temperatures. Juveniles in the HRE avoid depths less than -30 feet MLW and exhibit a preference for salinities above 27 ppt, temperatures above 5°C, and dissolved oxygen concentrations of 10 to 11 mg/l (Steimle et al. 1999c).

Cobia

Cobia is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the mid-Atlantic states to spawn. Adults are rarely found as far north as Massachusetts. Habitat preference of this species is high salinity bays, estuaries, and seagrass habitats. Cobia prefers temperatures greater than 20°C and salinities greater than 25 ppt (Richards 1967). One YOY juvenile was caught off Cliffwood Beach, New Jersey, with a beach seine within 100 feet of shore in 1999 (USACE 2000).

Atlantic Mackerel

Atlantic mackerel overwinter in deep water on the continental shelf from Sable Island Bank (Canada) to Chesapeake Bay and in spring move inshore and northeast. This pattern in reversed in the fall. In general, juveniles are found in some inshore bays and estuaries as well as offshore at salinities greater than 25 ppt. Adults are commonly found in open sea although occasionally in open bays with lower salinity limits of approximately 25 ppt. The geographical and seasonal distribution of juveniles and adults is generally similar, although juveniles tend to be distributed further inshore than adults in the spring and fall (Studholme et al. 1999).

King and Spanish Mackerel

King and Spanish mackerels are highly migratory epipelagic, neritic fish that migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and off the South Atlantic coast. Thus, only a few adults of this species will be expected to inhabit Mid-Atlantic Bight coastal waters. In contrast, Spanish mackerel spawn as far north as Sandy Hook and Long Island in late August to late September (Godcharles and Murphy 1986).

Summer Flounder

Summer flounder exhibit strong inshore-offshore movements. Planktonic larvae and post-larvae derived from offshore fall and winter spawning migrate inshore, entering coastal and estuarine nursery areas to complete transformation. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. As long as other conditions are favorable, substrate preferences and prey availability are the most important factors affecting distribution. Some studies indicate that juveniles prefer mixed or sandy substrates, others show that mud and vegetated habitats are used. Adult summer flounder inhabit shallow, inshore, and estuarine waters during warmer months and migrate offshore in the fall. Adults are reported to prefer sandy habitats, but can be found in a variety of habitats with both mud and sand substrates (Packer et al. 1999).

Winter Flounder

Winter flounder spawning occurs from late winter through early spring, peaking south of Cape Cod in February and March. Eggs are found inshore in depths of -1 to -13.5 feet MLW and have been collected in plankton nets offshore, e.g., on Georges Bank at depths of -400 feet MLW or less during March to May. Eggs are adhesive and demersal and are deposited on a variety of substrates, but sand is the most common; they have been found attached to vegetation and on mud and gravel. Larvae are negatively buoyant and non-dispersive; they sink when they stop swimming. Thus, recently settled YOY juveniles are found close to spawning grounds and in high concentrations in depositional areas with low current speeds. YOY juveniles migrate very little in the first summer, move to deeper water in the fall, and remain in deeper cooler water for much of the following year. Habitat utilization by YOY is not consistent across habitat types and is highly variable among systems and from year to year. Several field and lab studies suggest a “preference” for muddy/fine sediment substrates where they are most likely to have been deposited by currents. Adult winter flounder prefer temperatures of 12 to 15°C, dissolved oxygen concentrations greater than 2.9 mg/l, and salinities above 22 ppt, although they have been shown to survive at salinities as low as 15 ppt. Mature adults are found in very shallow waters during the spawning season (Pereira et al. 1999).

Windowpane

Windowpane is a shallow water mid and inner-shelf species found primarily between Georges Bank and Cape Hatteras on fine sandy sediment. Spawning occurs on inner shelf waters, including many coastal bays and sounds, and on Georges Bank. Juveniles and adults are similarly distributed. They are found in most bays and estuaries south of Cape Cod throughout the year at a wide range of depths (less than -5 to -130 feet MLW), bottom temperatures (3 to 12°C in the spring and 9 to 12°C in the fall), and salinities (5.5 to 36 ppt). Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults occur primarily on sand substrates off southern New England and Mid-Atlantic Bight (Chang et al. 1999).

Sand Tiger Shark

The sand tiger shark is a common littoral shark found in temperate and tropical waters from Gulf of Maine to Florida. It ranges from the surf zone, in shallow bays, and around coral and rocky reefs down to at least 191 meter depth on the outer continental shelf. Female tends to give birth in warm-temperate waters. Reproduction features ovophagy or uterine cannibalism, and limit the litter size to one or two pups. Juveniles are commonly found in estuaries of the eastern United States and are susceptible to runoff and pollution (Compagno 1984).

Sandbar Shark

The sandbar shark is an abundant, coastal-pelagic shark of temperate and tropical waters that occurs inshore and offshore. It is found on continental and insular shelves and is common at bay mouths, in harbors, inside shallow muddy or sandy bays, and at river mouths, but tends to avoid sandy beaches and the surf zone. Sandbar sharks migrate north and south along the Atlantic coast, reaching as far north as Massachusetts in the summer. Sandbar sharks bear live young in shallow Atlantic coastal waters between Great Bay, New Jersey, and Cape Canaveral, Florida. The young inhabit shallow coastal nursery grounds during the summer and move offshore into deeper, warmer water in winter. Late juveniles and adults occupy coastal waters as far north as southern New England and Long Island (Compagno 1984).

Clearnose Skate

Clearnose skate occurs along the eastern United States coast from the Nova Scotian Shelf to northeastern Florida as well as in the northern Gulf of Mexico from northwestern Florida to Texas. Juvenile clearnose skate in the Long Island Sound and HRE were taken most often during September and October, but is a relatively rare species in the Long Island Sound and HRE. Juveniles have a depth range of 5 to 7 meters, temperature preference between 16 to 22°C, and a salinity preference between 22 to 30 ppt. Adults exhibits similar season distribution and environmental preference as juveniles (Packer et al. 2003a).

Little Skate

Little skate occurs from Nova Scotia to Cape Hatteras and is one of the most dominant members of the demersal fish community of the northwest Atlantic. Juveniles and adults have similar habitat preference, and can be found over sandy and gravelly bottoms and also over mud. During the spring and fall seasons, little skate in the Long Island Sound are most abundant on transitional and sand bottoms. The spring, summer, and all depth preference for juveniles and adults in Long Island Sound range between 9 to 27 meters. Salinity preference is near full saline water or 32 ppt and temperature preference is 2 to 15°C (Packer et al. 2003b).

Winter Skate

Winter skate occurs from the south coast of Newfoundland and the southern Gulf of St. Lawrence to Cape Hatteras. Juveniles and adults exhibits similar habitat preference, and can be found over sand and gravel bottoms. This species tends to be nocturnal and remains buried in depressions during the day and are more active at night. Juveniles and adults have a depth preference between 5 to 8 meters, temperature preference of 4 to 13°C during the spring, fall, and winter and 16 to 21°C during the summer, and salinity preference between 23 to 32 ppt (Packer et al. 2003c).

7.3.1.2 Harlem River

A review of NOAA's EFH Mapper[8] found no EFH designated species within the Harlem River. However, it is reasonable to assume that some of the species identified along the Hudson River and East River may enter into this water body.

7.3.1.3 East River

A review of NOAA's EFH Mapper[9] found one EFH designated species, the smooth dogfish, within the segment of the East River which the HVDC Transmission System will occupy. However, it is reasonable to assume that some of the species identified along the Hudson River or in other segments of the East River may enter into this water body.

Smooth Dogfish

The smooth dogfish (*Mustelus canis*) is a coastal shark species found from Massachusetts to Northern Argentina in the Atlantic Ocean. They inhabit continental shelves and are typically found in inshore waters down to 200m. In the winter they congregate in North Carolina and Chesapeake Bay and move along the coast when the bottom water warms up to 6 to 70° C (Compagno, 1984). They feed on large crustaceans such as crabs and American lobsters, as well as small bony fish.

7.3.2 Avoidance and/or Minimization of Potential Impacts

Trenching activities associated with cable installation may cause a temporary and localized period of elevated suspended sediments within the Hudson River, Harlem River, and East River. However, such temporary and localized increase in turbidity will be insignificant and will not create a barrier to fish movement. The majority of the fluidized sediments are expected to refill the cable trench and not be dispersed through the habitat. Some finer grain sediments (silts and clay) that become suspended will travel further distance from the jet plowing activity, but will be similar to temporary spikes of turbidity from storm events, although to a much more localized extent. BMPs will be implemented to ensure the construction activities will not degrade water quality, particularly in the areas of the Hudson River where re-suspension of existing contaminants may occur. Construction windows will also be implemented to ensure impacts from construction activities to migratory species are avoided and/or minimized.

During the installation and construction of the cables, a number of vessels, including tugs, barges, cranes, and workboats may be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials thus the potential for an oil spill. Additionally, an inadvertent release of drilling fluids may occur at the HDD entry and exit locations. BMPs will be employed throughout construction with the appropriate spill response plans implemented which will avoid and/or minimize any impacts from oil and fluid spills. The waters of the HVDC Transmission System route are also frequented by various water vessels on a daily basis

[8] http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx, accessed April 11, 2011
[9] http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx, accessed April 11, 2011

and the introduction of vessels to the area during the construction period will not change the potential for an oil or fluid spill compared to existing conditions.

There are many natural and anthropogenic sources of ambient noise in the environment with the potential to impact fish species. Natural sources include wind, wave/tidal action, cracking ice, and marine life. Anthropogenic or human-generated noise may include recreational and commercial ship traffic, dredging, construction, oil drilling and production, and geophysical surveys (EIA 2008). The installation of the underwater cables will result in a certain level of noise from service vessels and equipment. Underwater noise from construction activities will be short-term and will not involve pile driving. Noise associated with the construction activities may temporarily result in fish species avoiding the construction area during periods when work is being done. Overall, impacts to EFH designated species from underwater noise will be insignificant.

Construction of the HVDC Transmission System could potentially impact small, larval EFH designated bottom fish species, particularly summer, winter, and windowpane flounders that occupy the nearshore estuarine waters. Demersal EFH designated species (flounders) may remain in the sediment to seek shelter from construction activities. The overall impact of finfish species will be limited, since most fish will move away from the construction operation as it approaches, thus having an insignificant impact to the overall populations. In addition, the Applicants have coordinated with state agencies to develop construction windows for the installation activities.

The construction of the HVDC Transmission System is expected to cause temporary, short-term impacts to benthic habitats as well as to benthic prey organisms. However, the EFH designated species are expected to feed in surrounding, unaffected areas, including existing benthic habitat adjacent to the construction corridor. Therefore, any impacts will be insignificant due to the temporary, localized and overall limited reductions in available benthic food sources. In addition, recruitment and re-colonization of the benthic infaunal communities is expected to occur immediately following construction. Studies conducted on offshore sand borrow areas off the outer New Jersey coast indicated that benthic communities were re-established within 8 to 9 months, i.e., within one annual recruitment period after dredging (USACE 1999). Additionally, the HVDC Transmission System area is a small portion of this type of habitat in the region, thus the overall impact on the EFH designated species will be insignificant.

Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the Lower Bay of New York Harbor and found that during bottom disturbance, and immediately after an area has been disturbed, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Species attracted to feed in the HVDC Transmission System area will be mostly juvenile and adult stages of flounders and opportunistic species (e.g., striped bass) that can avoid the construction activities.

In areas where conventional dredging is employed, typically for deeper burial areas such as at crossings of a navigation channel, construction will involve sediment removal, cable-laying, and then backfilling. Depending on the nature of the backfill, the sediment surface characteristics could be altered since it is unlikely that exactly the same grain size composition will be created as existed prior to cable installation. Depending on currents and erosional forces, backfill will be used that is anticipated to remain in place. However, whatever the backfill characteristics are, they are likely to become colonized over time with benthic organisms. Given the small amount of anticipated conventional dredging, any altered prey abundance or modified substrate characteristics may have an insignificant effect on fish species.

Additionally, the placement of rip-rap or concrete mats along the route could impact benthic biota and other immobile or slow-moving benthic organisms. The rip-rap or concrete mats will provide additional new habitat for epibenthic organisms to colonize, and therefore the EFH designated species will be only insignificantly impacted by the temporary and localized reductions in available benthic food sources. Also, the rip-rap or concrete mats will provide areas of shelter, structure, or cover typically sought by fish for protection from predators (Johnson and Stickney 1989; Ogden 2005) and beneficial for some of the EFH designated species.

Construction will typically occur twenty four hours per day seven days per week, requiring the use of lights on construction vessels. Nighttime lighting may be an attractant to some EFH species, causing them to move into lighted areas. If the jetting has increased suspended sediments, attracted fish may experience impaired respiration from clogging of gills. However, the suspended sediments will be bottom oriented and the attractive lighting will be at the surface, so this effect is likely to be insignificant. Lights may also be an attractant to certain fish prey items, which could also cause EFH species to be attracted to the vessels.

8.0 WILDLIFE

This section describes the existing wildlife species typical of the terrestrial and/or aquatic habitats along the Facility route. This section also describes the potential impacts to wildlife and wildlife habitats that may result from the construction and operation of the Facility, along with the methods that will be used to avoid and/or minimize those impacts

The Facility includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within Lake Champlain, the Hudson River, Harlem River and East River. The majority of the terrestrial portions of the Facility are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximately 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; (6) the Luyster Creek converter station area in Astoria; and (7) the approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation. From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority ("NYPA").

8.1 Non-Avian Terrestrial Wildlife

This section provides a discussion of the existing non-avian wildlife with the potential to occur along underground portions of the Facility, including mammals, reptiles and amphibians and invertebrates. The wildlife described in this section includes terrestrial and semi-aquatic species that may be found using upland, wetland, and small freshwater aquatic habitats along the primarily underground portions of the Facility route. Because avifauna may occur along both terrestrial and aquatic portions of the Facility, they are separately discussed in Section 8.2.

8.1.1 Existing Wildlife

Terrestrial habitats along the underground transmission cable route are within the Lower New England-Northern Piedmont Ecoregion. This ecoregion is characterized by limestone bedrock and topography that is dominated by lakes and low mountains (NYSDEC 2010i). Habitats include a variety of forests, woodlands, shrublands, and wetlands, along with agricultural pastures, croplands, urban and suburban environments.

Information provided on the existing non-avian wildlife and wildlife habitat is based on available publications and the data contained in the NYSDEC New York Nature Explorer database (NYSDEC 2009a), which includes the county-level occurrence data from the New York State Herp Atlas, along with information from the NYSNHP on rare plants, rare animals and rare and significant natural communities. The Applicants have also conducted field surveys along portions of the underground cable route paralleling the CP and CSX railroad rights-of-way. Ecological communities (Edinger et al. 2002) present along the surveyed portions of the Facility construction zone were mapped. Section 4 provides further information on terrestrial communities along the Facility route and Section 5 describes the wetland community types. Section 9 addresses threatened or endangered wildlife species under 6 NYCRR Part 182 and the federal Endangered Species Act ("TE species").

8.1.1.1 Upland Habitats

Upland habitats along the underground transmission cable route include successional old fields, shrublands, hardwood and mixed pine forests, agricultural lands, rights-of-way, urban and suburban residential lands, and other disturbed or human-dominated environments. Because the transmission cables will be installed underground along existing, maintained railroad and roadway rights-of-way, forested habitat along the construction corridor most commonly exists as successional or shrubby forest edge.

Forested habitats adjacent the Facility route typically have a canopy consisting of oak, hickory, maple, ash, aspen, birch, elm, and/or box elder, sometimes mixed with white pine or pitch pine. Some characteristic mammal species for these forested communities include Eastern chipmunk (*Tamias striatus*), gray squirrel (*Sciurus carolinensis*), gray fox (*Urocyon cinereargenteus*), fisher (*Martes pennanti*), American black bear (*Ursus americanus*), hoary bat (*Lasiurus cinereus*), moose (*Alces alces*), Virginia opossum (*Didelphis virginiana*), smoky shrew (*Sorex fumeus*), masked shrew (*Sorex cinereus*), woodland vole (*Microtus pinetorum*), and white-footed mouse (*Peronyscus leucopus*) (NYSDEC 2007b; Smithsonian National Museum of Natural

History 2010). Dry or moist upland forests may host reptiles and amphibians such as red-bellied snake (*Storeria occipitomaculata*), dusky salamander (*Desmognathus fuscus*), Eastern newt (*Notophthalmus viridescens*), redback salamander (*Plethodon cinereus*), and wood frog (*Rana sylvatica*) (NYSDEC 2007b). Forest edges near clearings, agricultural areas, rights-of-way, and wetlands typically support species such as white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), Eastern pipistrelle (*Pipistrellus subflavus*), long-tailed shrew (*Sorex dispar*), red bat (*Lasiurus borealis*), Eastern cottontail (*Sylvilagus floridanus*), gray treefrog (*Hyla versicolor*) and milk snake (*Lampropeltis triangulum*).

Old fields, successional shrubs, and agricultural habitats are common along the underground portions of the cable route. Wildlife inhabiting these areas may include white-tailed deer, eastern cottontail, woodchuck (*Marmota monax*), deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*) and racer (*Coluber constrictor*). Near residential and suburban areas, wildlife tolerant of human disturbance like raccoon (*Procyon lotor*), woodchuck, gray squirrel, white-tailed deer, coyote, striped skunk (*Mephitis mephitis*), big brown bat (*Eptesicus fuscus*), American toad (*Bufo americanus*) and common garter snake (*Thamnophis sirtalis*) are often predominant.

Urban and industrial landscapes, such as the downtown Schenectady area and the Luyster Creek converter station site do not typically have a high diversity of wildlife. Wildlife present may include species well-adapted for foraging and/or living in human-dominated environments, particularly introduced species like house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*).

8.1.1.2 Wetlands and Freshwater Habitats

Wetland habitats identified along the underground portions of the Facility route include deep and shallow marshes dominated by emergent vegetation, wet meadows, shrub swamps, shrubby wet ditches, floodplain forests, riparian edges, and forested wetlands. Open water areas such as rivers, small streams, ponds, pools, and lakes also occur in the vicinity of the Facility. Wetlands and freshwater waterbodies along the underground Facility construction zone may provide habitat for a variety of terrestrial and semi-aquatic wildlife species.

Emergent marshes, wet meadows and pond edges are often associated with vegetation such as cattails (*Typha* spp.), sedges (*Carex* spp.), rushes (*Juncus* spp.), bulrushes (*Scirpus* spp.), and spike rushes (*Eleocharis* spp.). These wetlands may support mammals such as Northern short-tailed shrew (*Blarina vervicauda*), star-nosed mole (*Condylura cristata*), meadow vole, moose, beaver (*Castor canadensis*), and muskrat (*Ondatra zibethicus*). Both beaver and muskrat signs were noted during field surveys along portions of the Facility route. A variety of amphibians are typical of these wetland and aquatic habitats, including bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*) and Northern leopard frog (*Rana pipiens*). Common garter snake, smooth green snake (*Liochlorophis vernalis*), northern water snake (*Nerodia sipedon*), and copperhead (*Agkistrodon contortrix*) are typically associated with these open wetland and aquatic habitats; deeper areas near lakes and ponds may also support painted turtle (*Chrysemys picta*), common map turtle (*Graptemys geographica*), and snapping turtle (*Chelydra serpentina*).

Forested wetlands are dominated by species such as red maple, cottonwood, oaks, ashes, elms, and box elder. Wildlife in forested wetlands is often associated with areas of pools and sphagnum moss, thickets, damp leaf litter, floodplains and/or river bottoms. Species using these habitats include ermine (*Mustela erminea*), pickerel frog (*Rana aplustris*), gray treefrog, and red-bellied snake. Seasonal or vernal pools in forested areas support a distinct community of breeding amphibians, which may include spring peeper (*Pseudacris crucifer*), spotted salamander (*Ambystoma maculatum*), and wood frog. Vernal pool habitat is also important to several New York State-listed species of special concern, particularly blue-spotted salamander (*Ambystoma laterale*) and Jefferson salamander (*Ambystoma jeffersonianum*) (see Section 9 for information on state-listed TE species).

Water shrew (*Sorex palustris*), Northern two-lined salamander (*Eurycea bislineata*) and northern slimy salamander (*Plethodon glutinosus*) are frequently found in habitats immediately adjacent to streams and/or in riparian areas. River otters (*Lontra canadensis*) are known to inhabit the Hudson River Valley (NYSDEC 2010j), and may be present along both underground and underwater portions of the cable route.

8.1.2 Avoidance and/or Minimization of Potential Impacts

The Applicants have avoided and/or minimized impacts to terrestrial wildlife habitats by routing the cable underwater to the extent possible. Where underground bypass routes are required, the Applicants have sited the majority of the transmission cable along existing railroad and roadway rights-of-way. To further avoid and/or minimize impacts, the Applicants have proposed to use the HDD method at all landfall locations and to go underneath two state parks (see Section 2). Where the HDD method is used, surface impacts to wildlife habitats between the drill entry and exit points will be avoided and/or minimized.

Use of previously disturbed railroad and roadway corridors for the installation of the underground transmission cables will avoid and/or minimize the potential impacts to wildlife use within and adjacent to the Facility. In areas where forested communities occur, routing the Facility along the railroad and roadway rights-of-way avoids and/or minimizes impacts to the canopy vegetation and avoids new fragmentation of forested habitats. Fragmentation has been demonstrated to reduce the size of the habitat available to forest-dwelling wildlife by isolating patches of otherwise suitable forested habitat. Since the Facility will not result in any new corridors through forested habitat, fragmentation of forested habitats will be insignificant.

In a select few areas within the railroad rights-of-way, forested cover may be converted to a shrub community as part of the Applicants' Vegetation Management Plan. During operation of the Facility, activities associated with this plan will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the transmission cables and/or selective cutting to prevent the establishment of large trees directly over the cables. The Applicants will develop a Vegetation Management Plan as part of the EM&CP. Any vegetation management activities currently conducted by the railroads within the right-of-way will continue following the construction and operation of the underground transmission cable.

It is expected that most impacts to terrestrial wildlife habitats adjacent to the underground transmission cable corridor will be temporary. During construction, wildlife may be temporarily impacted by noise, vegetation clearing, lighting and construction activities within the Facility construction zone. Mobile wildlife species are expected to move into similar adjacent habitats during construction and return to the area once construction is completed. The Applicants have initiated discussions with NYNHP, NYSDEC, and USFWS for additional information and recommendations for the avoidance and/or minimization of potential impacts on wildlife species during construction and operation of the Facility.

Upon completion of construction activities, the Applicants will conduct initial restoration, including soil stabilization and temporary seeding of the construction areas. Once erosion control vegetation cover has been established, the construction corridor will be allowed to re-vegetate naturally. As described above, only limited vegetation management will be conducted by the Applicants for repairs or other maintenance of the cables and for selective cutting to prevent the establishment of large trees directly over the cables. See Section 4 for additional information on avoidance and/or minimization of vegetation impacts. Since the Luyster Creek converter station is located in an urban environment, impacts to wildlife or wildlife habitats are anticipated to be insignificant from construction at aboveground facilities.

8.2 Avifauna

This section provides a discussion of the existing birds potentially occurring along both underground and underwater portions of the Facility route. This includes avifauna that may be using upland terrestrial, wetland, freshwater aquatic, coastal, and marine habitats along the route.

Information provided on existing birds and avian habitats is based on publications and the data contained in the NYSDEC New York Nature Explorer database (NYSDEC 2009a), which includes the county-level distributions of birds recorded in the New York State Breeding Bird Atlas, along with information from the NYSNHP on rare plants, rare animals and rare and significant natural communities. The Applicants have also conducted field surveys along portions of the underground cable route paralleling the CP and CSX railroads. Ecological communities (Edinger et al. 2002) that are present along Facility construction zone were mapped. Section 4 provides further information on terrestrial communities along the cable route and Section 5 describes the wetland community types. Section 9 addresses TE species.

8.2.1 Terrestrial and Freshwater Aquatic Avifauna

A significant portion of the Facility route is located underwater within Lake Champlain and freshwater portions of the Hudson River and Hudson River Estuary. These large freshwater waterbodies are used seasonally by waterfowl and provide fishing and hunting habitat for raptor species such as osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*). Brackish estuarine, saline, coastal, and marine habitats adjacent to the underwater cable corridor in the lower Hudson River estuary, Harlem River and East River may be used by waterfowl and shorebirds as well as coastal and marine seabirds. Potential habitat exists along the underground portions of the transmission cable route for a variety of resident and migrant birds, including various species of passerines, raptors, wading birds, and game birds that use upland, wetland and/or riparian habitats.

8.2.1.1 Upland Habitats

Upland habitats along the terrestrial portions of the underground transmission cable corridor include successional old fields, shrublands, hardwood and mixed pine forests, agricultural lands, rights-of-way, urban and suburban residential lands, and other disturbed or human-dominated habitats. Because the transmission cables will be installed mostly along existing, maintained railroad and roadway rights-of-way, forested habitats within the construction corridor most commonly exist as successional or shrubby forest edge.

Forested habitats along the transmission cable route typically have a canopy consisting of oak, hickory, maple, ash, aspen, birch, elm, and/or box elder, sometimes mixed with white pine or pitch pine. Year-round residents and wintering bird species in forested habitats typically include black-capped chickadee (*Poecile atricapillus*), hairy woodpecker (*Picoides villosus*), pileated woodpecker (*Dryocopus pileatus*), white-breasted nuthatch (*Sitta carolinensis*), wild turkey (*Meleagris gallopavo*), and blue jay (*Cyanocitta cristata*) (NYSDEC 2007b).

The community of breeding birds consists of both year-round residents and migrant birds that arrive in the spring at the beginning of the breeding season; for most songbirds in New York this is typically April, May, or early June. Breeding birds characteristic of forested habitats along the transmission corridor include barred owl (*Strix varia*), Eastern screech-owl (*Megascops asio*), ruffed grouse (*Bonasa umbellus*), broad-winged hawk (*Buteo platypterus*), black-and-white warbler (*Mniotilta varia*), black-throated green warbler (*Dendroica virens*), American redstart (*Setophaga ruticilla*), blue-gray gnatcatcher (*Poliptila caerulea*), Eastern wood-pewee (*Contopus virens*), ovenbird (*Seiurus aurocapilla*), great crested flycatcher (*Myiarchus crinitus*), least flycatcher (*Empidonax minimus*), red-bellied woodpecker (*Melanerpes carolinus*), red-eyed vireo (*Vireo olivaceus*), wood thrush (*Hylocichla mustelina*) and scarlet tanager (*Piranga olivacea*) (NYSDEC 2007b).

Many bird species nest at the interface of forested habitats and open shrubby habitats. Typical bird species found along open or shrubby forest edges adjacent to old fields, agricultural areas, and/or rights-of-way include blue-winged warbler (*Vermivora pinus*), brown thrasher (*Toxostoma rufum*), Eastern towhee (*Pipilo erythrophthalmus*), field sparrow (*Spizella pusilla*), rose-breasted grosbeak (*Pheucticus ludovicianus*), black-billed cuckoo (*Coccyzus erythropthalmus*), and gray catbird (*Dumetella carolinensis*).

Old fields, scrubby successional areas, and agricultural habitats are common along the terrestrial portions of the underground Facility route. Species such as indigo bunting (*Passerina cyanea*), red-tailed hawk (*Buteo jamaicensis*), killdeer (*Charadrius vociferus*), American robin (*Turdus migratorius*), brown-headed cowbird (*Molothrus ater*), barn swallow (*Hirundo rustica*), and common grackle (*Quiscalus quiscula*) are expected to use these areas. Grassland habitats without dense woody vegetation may support killdeer, Eastern meadowlark (*Sturnella magna*), Eastern bluebird (*Siala sialis*), and bobolink (*Dolichonyx oryzivorus*).

Some birds are well-adapted to residential suburban environments, foraging in lawns, gardens, tree-lined streets, and city parks. Black-capped chickadee, downy woodpecker (*Picoides pubescens*), blue jay, American robin, gray catbird, house wren (*Troglodytes aedon*), American crow (*Corvus brachyrhynchos*), Eastern screech owl, Northern flicker (*Coloptes auratus*), mourning dove (*Zenaida macroura*), and Northern mockingbird (*Mimus polyglottus*) are often found in residential areas.

Urban and industrial environments, such as downtown Schenectady and the Luyster Creek converter station site do not typically support a high diversity of wildlife. However some species, such as rock pigeon (*Columba livia*) and house sparrow (*Passer domesticus*), are well-adapted to living in human-dominated environments. Chimney swifts (*Spizella passerina*) often nest on rooftops and can frequently be seen foraging over urban areas.

8.2.1.2 Wetlands

Wetland habitats identified along the terrestrial portions of the underground transmission cable corridor include deep and shallow marshes dominated by emergent vegetation, shrub swamps, shrubby wet ditches, floodplain forests, riparian edges, and forested wetlands. Open water areas such as rivers, small streams, ponds, pools, and lakes also occur in the vicinity of the Facility. Wetlands and freshwater habitats along the transmission corridor may support a variety of terrestrial and semi-aquatic wildlife species.

Emergent wetland habitats along the transmission cable corridor include persistent emergent marshes, wet meadows, pond edges and freshwater tidal marshes. A number of avian species of special concern such as American bittern (*Botaurus lentiginousus*), least bittern (*Ixobrychus exilis*) and pied-billed grebe (*Podilymbus podiceps*) are associated with persistent emergent wetlands (see Section 4.9). Other characteristic species that may be present in cattail marshes and other similar wetlands include red-winged blackbird (*Agelaius phoeniceus*), swamp sparrow (*Melospiza georgiana*) and Virginia rail (*Rallus limicola*). Wet meadows, moist thickets, and shrub swamps may be used by species such as American woodcock (*Scolopax minor*), willow flycatcher (*Empidonax traillii*), green heron (*Butorides virescens*), yellow warbler (*Dendroica petechia*), and common yellowthroat (*Geothlypis tricha*).

Forested wetlands in the Facility area typically have a canopy of red maple, cottonwood, oaks, ashes, elms, and/or box elder. Some bird species that use upland forested habitats, such as great crested flycatcher, also may breed in forested wetlands. Additional species that prefer forested wetland habitats include veery (*Catharus fuscescens*), wood duck (*Aix sponsa*) and Northern waterthrush (*Seiurus noveboracensis*).

8.2.1.3 Freshwater Aquatic Habitats

The underwater Facility route traverses freshwater habitats within Lake Champlain and the Hudson River. Smaller freshwater habitats and riparian areas occur along streams, rivers and ponds crossed by the underground portion of the Facility route. Certain terrestrial species, such as warbling vireo (*Vireo gilvus*), ruby-throated hummingbird (*Archilochus colubris*), Eastern phoebe (*Sayornis phoebe*), and yellow warbler, frequently nest in riparian areas near waterbodies. Belted kingfisher (*Megaceryle alcyon*), spotted sandpiper (*Actitis macularius*) and tree swallow (*Tachycineta bicolor*) may be found foraging along or over open water areas, ponds, lakes, and rivers.

Large numbers of waterfowl travel through Lake Champlain and the Hudson River Valley during migration, particularly in the fall. Open water areas that do not freeze completely in the winter also provide important habitat for concentrations of wintering waterfowl. The New York State Ornithological Association has been conducting winter waterfowl counts in New York annually since 1955. Wintering waterfowl species that may be observed in the Lake Champlain area include Canada goose (*Branta canadensis*), American black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), bufflehead (*Bucephala albeola*), common goldeneye (*Bucephala clangula*), common merganser (*Mergus merganser*), and hooded merganser (*Lophodytes cucullatus*). Canvasback (*Athaya valisineria*), ring-necked duck (*Athaya collaris*), greater scaup (*Athaya marila*), and lesser scaup (*Athaya affinis*) are known to winter in the Hudson River Valley.

Within some freshwater areas of the Hudson River Estuary below the Troy dam, tidal fluctuations expose intertidal mudflats. Freshwater tidal mudflats can provide foraging habitat for significant numbers of shorebirds during migration, including species such as least sandpiper (*Calidris minutilla*), semipalmated sandpiper (*Calidris pusilla*), pectoral sandpiper (*Calidris melanotos*), greater yellowlegs (*Tringa melanoleuca*), killdeer, spotted sandpiper, and short-billed dowitcher (*Limnodromus griseus*), among others (Yozzo et al. 2005). In general, the underwater transmission cable corridor is located in permanently submerged portions of the Hudson River Estuary, so impacts to intertidal flats are not expected. The Applicants have proposed the use of the HDD method to exit and enter the Hudson River, which will further avoid and/or minimize any impacts to intertidal mudflats.

8.2.2 Coastal and Marine Avifauna

Coastal and marine habitats occur in the vicinity of the underwater Facility area in the estuarine waters of the Hudson, Harlem and East Rivers. Because the cable is underwater, away from vegetated and/or intermittently exposed, intertidal habitats, the Facility is not expected to impact any brackish estuarine wetlands or coastal beaches. Avifauna inhabiting freshwater tidal marshes and mudflats along the Hudson River Estuary are also discussed above in Section 8.2.1.

Coastal and brackish estuarine marshes occur adjacent to the underwater transmission cable route, particularly in the lower Hudson River. These wetlands may support many species similar to those occurring in freshwater marshes (see Section 8.2.1.2) such as least bittern, red-winged blackbird, Virginia rail, and song sparrow (*Melospiza melodia*), along with savannah sparrow (*Passerculus sandwichensis*) and clapper rail (*Rallus longirostris*).

Intertidal mudflats and beaches in the Hudson River estuary may provide habitat for a variety of shorebirds, terns, and gulls. In general, these habitats are not crossed by the underwater transmission cable route, but may occur in adjacent shoreline areas. Some muddy areas may be exposed at low tides. Gulls, such as herring gull (*Larus argentatus*) and great black-backed gull (*Larus marinus*), may use this kind of habitat as a resting and foraging. The rocky shoreline and rip-rap could potentially provide marginal habitat for purple sandpiper (*Calidris maritima*) in the winter; and mudflats can be used by migrating shorebirds such as least sandpiper (*Calidris minutilla*) and semipalmated plover (*Charadrius semipalmatus*). Additionally, an area along the Harlem River and East River is mapped by the NYSDEC as intertidal mudflats (see Section 5), which could support migrating shorebirds.

Because the coastal areas near the Luyster Creek converter station are located within a highly urbanized landscape, shorebird habitat is minimal. A small area adjacent to Luyster Creek in the vicinity of the proposed converter station site is mapped by the NYSDEC as intertidal mudflats, which could support migrating shorebirds. The Applicants have proposed the use of the burial and HDD methods to cross the East River and will not be in-water at Luyster Creek, which will avoid any impacts to shoreline or intertidal habitats at these locations.

8.2.3 Bird Conservation Areas

Under the New York State BCA Program, the NYSDEC designates certain public lands as BCAs, to integrate bird conservation into planning and management of state lands (NYSDEC 2010k). Six BCAs are located along Lake Champlain or the Hudson River in the vicinity of the proposed corridor for the underwater transmission corridor. Additionally, the Black Creek Marsh BCA is located near the underground bypass route in Albany County.

1) Valcour Island BCA is part of the Lake Champlain Islands Management Complex administered by the NYSDEC. It is designated as a BCA because it supports the largest great blue heron rookery in New York State, with approximately 550 nests. The area also provides breeding and migratory habitat for shorebirds, waterfowl, and songbirds (NYSDEC 2010l). The Facility route passes less than 0.5 miles from Valcour Island BCA, between approximate MPs 28 and 30.

2) Lake Champlain Marshes BCA includes wetland complexes within six Wildlife Management Areas (WMAs) along the western shore of Lake Champlain. This BCA contains large emergent marshes, forested wetlands and shrub swamps as well as upland grasslands, forests and shrublands. The BCA designation is primarily due to the diversity of bird species using the area, the importance of the marshes as a migratory stopover supporting concentrations of waterfowl and wading birds, and the presence of habitat for variety of TE species and habitat for state species of special concern (NYSDEC 2010l). Habitats present in the BCA may be used by TE species such as American bittern, least bittern, osprey, upland sandpiper (*Bartramia longicauda*), black tern (*Chlidonias niger*), northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and the pied-billed grebe. Habitats present in the BCA may also be used by species of special concern such as vesper sparrow (*Pooecetes gramineus*) and grasshopper sparrow (*Ammodramus savannarum*) (NYSDEC 2010). The Facility route passes within approximately 1.5 miles of the Lake Champlain Marshes BCA between approximate MPs 32 and 35.

3) The Crown Point BCA is located at the Crown Point State Historic Site at the tip of the Crown Point peninsula. Due to the geography, the peninsula serves as a corridor that concentrates migrant birds, particularly during spring migration (NYSDEC 2010l). The

Facility route passes less than 0.25 miles from the Crown Point BCA at approximate MP 74.

4) Black Creek Marsh BCA provides wetland habitats that are used by a variety of waterfowl and wading birds during the breeding season and as a migratory stop-over. The BCA includes the Black Creek WMA, along with adjacent conservation easements (NYSDEC 2010l). TE species within Black Creek Marsh BCA may include pied-billed grebe, American bittern, least bittern, short-eared owl, and the northern harrier. Species of special concern within Black Creek Marsh BCA may include the common nighthawk (*Chordeiles minor*). This BCA is located just west of the underground portion of the transmission cable route in Albany County. The Facility route passes less than 0.25 miles from the Black Creek Marsh BCA near approximate MP 187.

5) Tivoli Bay is a large freshwater tidal marsh within a largely undeveloped area along the Hudson River, which contains emergent marshes, mudflats, open water, and vegetated shallows. The area is primarily important for waterfowl during spring and fall migration, and may be used by osprey and bald eagles. Marshes and adjacent upland habitats also support a diverse community of migrating and breeding birds. Bald eagle and least bittern are among the TE species, and osprey is among the state-listed species of special concern that may occur in this BCA (NYSDEC 2010l). Tivoli Bay is part of the Hudson River National Estuarine Research Reserve (see Section 4.5). The Facility route passes less than 500 feet from the Tivoli Bay BCA between approximate MPs 235 and 237.

6) Constitution Marsh BCA is a mixed freshwater and brackish tidal marsh on the Hudson River’s east shore. The site provides important wetland habitats, and also serves as a migratory stop-over and wintering habitat for waterfowl, with high concentrations of American black duck. A number of TE species and may be present at the BCA, including least bittern, pied-billed grebe, Northern harrier, bald eagle, and peregrine falcon (*Falco peregrinus*) (NYSDEC 2010l). Osprey is a species of special concern the may be present at the BCA. The Facility route passes within approximately 0.5 miles of the Constitution Marsh BCA between approximate MPs 282 and 284.

7) Iona Island/Doodletown BCA is an important freshwater to brackish tidal wetland area that has been designated as part of the Hudson River National Estuarine Research Reserve. It is also considered Significant Coastal Fish and Wildlife Habitat (SCFWH) area (see Section 8.4.1) and a National Natural Landmark. The area provides important habitat for marshbirds, shorebirds and waterfowl, and upland habitats that support a variety of songbirds (NYSDEC 2010l). The Facility route passes within approximately 0.25 miles of the Iona Island/Doodletown BCA between approximate MPs 291 and 294.

8.2.4 Avoidance and/or Minimization of Potential Impacts

It is expected that temporary impacts to birds and bird habitats may result from construction and operation of the Facility. The installation of the transmission cables below ground avoids and/or minimizes impacts from collision and electrocution that have been frequently associated with overhead transmission wires and tower structures. The Applicants have further avoided and/or minimized impacts to potential bird nesting areas in terrestrial habitats by selecting a route that is primarily underwater. Where underground bypass routes are required, the Applicants have avoided and/or minimized impacts to habitat by siting the cable corridor parallel to existing disturbed railroad and roadway rights-of-way. To further avoid and/or minimize habitat impacts, the Applicants have proposed to use the HDD method at all landfall locations. Where the HDD method is used, surface impacts to shoreline habitats between the drill entry and exit points will be avoided and/or minimized.

Use of a previously disturbed railroad and roadway rights-of-way for the installation of the underground transmission cables will avoid and/or minimize the potential impacts to bird habitats. In areas where forested communities occur, routing along the railroad and roadway right-of-way avoids and/or minimizes impacts to the canopy vegetation and new fragmentation of forested habitats. Fragmentation has been demonstrated to reduce the size of the habitat available to forest-dwelling bird species by isolating patches of otherwise suitable forested habitat, and may also encourage colonization by brown-headed cowbird (*Molothrus ater*), a brood parasite that can reduce breeding success rate for other species. Since the proposed Facility will not result in any new corridors through forested habitat, fragmentation of forested habitats will be insignificant.

Construction and operation of the Facility are not anticipated to result in any permanent impact on terrestrial habitats along the underground transmission cable corridor except in a select few areas where forested cover may be converted to a shrub community as part of the Applicants' Vegetation Management Plan. During operation of the Facility, activities associated with this plan will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the transmission cables and/or selective cutting to prevent the establishment of large trees directly over the cables. The Applicants will develop a Vegetation Management Plan as part of the EM&CP. Any vegetation management activities currently conducted by the railroads within the right-of-way will continue following the construction and operation of the underground transmission cable. See Section 4 for additional information on avoidance and/or minimization of vegetation impacts.

During construction, it is expected that birds inhabiting the railroad and roadway rights-of-way and the immediately adjacent habitats may be temporarily impacted within the Facility construction zone. Most birds along the underground routes will temporarily move into similar adjacent habitats during construction and return once construction is completed. However, potential impacts could occur from increased stress, increased travel time to foraging areas from roosts or nest sites, and lower foraging success.

It is expected that if vegetation clearing along the underground portion of the transmission cable corridor is conducted during the breeding season, which for most species occurs in the spring and/or early summer, bird nests within the construction corridor may be impacted. Noise and construction activity also have the potential to result in parental abandonment of eggs or young in nests immediately adjacent to the construction area. The Applicants will continue discussions with NYNHP, NYSDEC, and USFWS, to determine if any additional impact avoidance and/or minimization measures are appropriate for bird species that may nest within the construction footprint.

Waterfowl, gulls and terns using aquatic habitats along the underwater portions of the transmission route in Lake Champlain, the Hudson River, Harlem River and/or East River, may be impacted due to noise from underwater cable installation techniques, HDDs and increased vessel traffic. It is expected that these birds will temporarily move into similar adjacent habitats during construction and return once construction is completed. However, potential impacts could occur from increased stress, increased travel time to foraging areas from roosts or nest sites, lower foraging success or if any adverse impacts on water quality or the aquatic food web result in impacts on the aquatic habitat and a lower availability of food resources. The Applicants will implement measures to avoid and/or minimize impacts from the construction and operation of the cable. Accordingly, any such impacts are expected to be insignificant. See Section 6 for additional information on water quality, including the avoidance and/or minimization of potential impacts.

If any sensitive breeding sites for freshwater, coastal, or marine species occur near underwater cable installation activities, noise and construction activity could potentially result in nest abandonment and/or lowered breeding success. Established colonial breeding areas such as heron rookeries and tern colonies may be particularly sensitive to human-related impacts. The Applicants have initiated discussions with the NYNHP, NYSDEC, and USFWS for additional information and recommendations regarding avoiding and/or minimizing impacts to birds along the proposed transmission cable route. The Applicants will continue discussions with these agencies to determine if any established heron rookeries, tern colonies, or raptor nests are located near the transmission cable corridor.

In general, the Applicants anticipate that any impacts to bird habitats in shoreline areas, freshwater or brackish tidal marshes, and/or intertidal habitats will be insignificant, since little of this habitat occurs within the Facility area, and/or selected construction methods will avoid and/or minimize impacts to these areas. The Applicants have proposed the HDD method for crossing habitats at the landfall locations near the Luyster Creek converter station as well as at other shoreline crossings in Lake Champlain, the Hudson River, Harlem River and East River, which will avoid and/or minimize impacts to the shoreline or intertidal habitats at those locations. Since the Luyster Creek converter station is located in an urban environment, impacts to avian habitats from construction at this aboveground structure are expected to be insignificant.

8.3 Non-Endangered Species Act Marine Mammals

8.3.1 Existing Marine Mammals

This section covers non-ESA marine mammals with the potential to occur in the Facility area. Section 9 addresses TE species. The non-ESA listed cetaceans and pinnipeds are protected under the Marine Mammal Protection Act (MMPA) of 1972 which gives the NMFS responsibility for the management and conservation of those species.

Table 8-1 lists the non-ESA listed cetaceans and pinnipeds known to occur in the coastal waters of Long Island, Staten Island and the greater New York City area. Detailed species profile information for the cetaceans and pinnipeds in the New York waters is provided below.

The Riverhead Foundation for Marine Research and Preservation (RFMRP) has operated the marine mammals and sea turtles rescue program since 1996. The program operates the New York State Marine Mammal and Sea Turtle Rescue Program and provides a record of the occurrences of various species for the waters of fourteen New York counties (Figure 8-1). On average, 150 animals are recovered each year with rescues occurring during every month of the year all around Long Island, Staten Island, and New York Harbor, and into the Hudson River. From 1996 through 2007, a total of 1,888 animals were recovered, including 1,190 (63 percent) pinnipeds, 417 (22 percent) sea turtles, and 281 (15 percent) cetaceans (RFMRP 2008).

Cetacean stranding records in the coastal areas of the greater New York City area are comprised of seven species: common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), harbor porpoise (*Phocoena phocoena*) (a federal and state species of special concern, discussed further in Section 9.2.4.1), striped dolphin (*Stenella coeruleoalba*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Risso's dolphin (*Grampus griseus*), and pilot whale (*Globicephala melas*) (RFMRP 2008). The large whale strandings and ship strikes in this region are comprised of three TE species: fin whale (*Balaenoptera physalus*), sei whale (*B. borealis*), and humpback whale (*Megaptera novaeangliae*) (RFMRP 2010) (these three species are covered in Section 9.2.4.1). Pinniped stranding occurs in all coastal areas in this region, with an increase in the western portions of Long Island and Staten Island in recent years. The pinniped strandings in this region are comprised of four species: harp seal (*Phoca groenlandicus*), harbor seal (*P. vitulina*), gray seal (*Halichoerus grypus*), and hooded seal (*Cystophora cristata*) (RFMRP 2008).

8.3.1.1 Cetaceans

Bottlenose Dolphin (*Tursiops truncates)*

The coastal morphotype of bottlenose dolphin is continuously distributed along the Atlantic coast south of Long Island, New York, around the Florida peninsula, and along the Gulf of Mexico coast. On the Atlantic coast, Scott et al. (1988 *as cited in* Waring et al. 2009) hypothesized a single coastal migratory stock ranging seasonally from as far north as Long Island, to as far south as central Florida, citing stranding patterns during a high mortality event in 1987-88 and observed density patterns. More recent studies demonstrate that the single coastal migratory stock hypothesis is incorrect, and there is instead a complex mosaic of stocks (Waring et al. 2009). In general, the primary habitat of the coastal morphotype of bottlenose dolphin extends from Florida to New Jersey during summer months and includes waters less than 20 meters deep, including estuarine and inshore waters (Waring et al. 2009). Although not within the vicinity of the HVDC Transmission System the waters along the north shore of Long Island were visited by approximately 200 bottlenose dolphin near Cold Spring, Huntington, Northport, Hempstead, Oyster Bay, Smithtown, and Rye, New York during the summer of 2009, (Durham et al. 2009).

Common Dolphin (*Delphinus delphis*)

In waters off the northeastern United States coast, common dolphins are associated with Gulf Stream features and prefer waters altered by underwater geologic features where upwelling occurs (Waring et al. 2009; NOAA 2010d). They occur from Cape Hatteras northeast to

Georges Bank (35° to 42°N) during the period from mid-January to May and move onto Georges Bank and the Scotian Shelf from mid-summer to autumn (Waring et al. 2009).

The total number of common dolphins off the United States and Canadian Atlantic coasts is unknown. The best abundance estimate for the western North Atlantic stock of common dolphin is 120,743 individuals. This is the sum of the estimates from two 2004 United States Atlantic surveys (Waring et al. 2009). Overall, this species is abundant worldwide, with a population estimate at approximately 3.9 million individuals (NOAA 2010d).

Herds range in size from about 10 to over 10,000 individuals, and association with other marine mammal species is not uncommon (NOAA 2010d; OBIS 2010b). Common dolphins are capable of diving to at least 650 feet (200 meters) for prey during the night, and usually rest during the day (NOAA 2010d). Diets of common dolphin consist of epipelagic schooling fish and cephalopods (e.g., squid) (NOAA 2010d; OBIS 2010b).

Although none occurred in the vicinity of the HVDC Transmission System, stranding reports from 2006 to 2007 for the coastal waters north of Long Island showed a total of seven bottlenose dolphin strandings occurred (RFMRP 2008).

Pilot Whale (*Globicephala macrorhynchus*)

In the western North Atlantic, pilot whale ranges from Cape Hatteras into the Caribbean and the Gulf of Mexico (Waring et al. 2009; OBIS 2010c). These whales often occur in groups of 25 to 50 individuals and are among the cetaceans that most frequently mass-strand, perhaps due to their strong social bonds (NOAA 2010e; OBIS 2010c). The total number of pilot whales off the eastern United States and Canadian Atlantic coasts is unknown. The sum of the estimates from the two 2004 United States Atlantic surveys place the population at 31,129 individuals, including long-finned pilot whales (Waring et al. 2009; NOAA 2010e).

This species is polygynous; males have more than one mate and are often found in groups with a ratio of one mature male to about every eight mature females. Males generally leave their birth school, while females may remain in theirs for their entire lifetime (NOAA 2010e). Gestation lasts approximately 15 months while lactation lasts for at least two years. The last calf born to a mother may be nursed for as long as 15 years. The calving interval is five to eight years, but older females do not give birth as often as younger females (NOAA 2010e).

The primary prey is squid, but they may also feed on octopus and fish. Feeding can take place in deep water of 1000 feet (305 meters) or more. Pilot whales are known to travel abreast in a long line, forming ranks, when swimming and looking for food. A single line can be over one kilometer (more than 0.5 mile) long (NOAA 2010e; OBIS 2010c).

Striped Dolphin (*Stenella coeruleoalba*)

This species occurs in the United States off the Pacific coast, in the northwestern Atlantic, and in the Gulf of Mexico. In general, this species prefers highly productive tropical to warm temperate waters (52-84°F [10-26°C]) that are oceanic and deep. These dolphins are often linked to upwelling areas and convergence zones (NOAA 2010f; OBIS 2010d).

Striped dolphins are abundant and widespread throughout the world as well as in offshore United States waters. Recent abundance estimates of the United States stocks are approximately 68,500 to 94,500 individuals. The worldwide population of this species is estimated at approximately 1.13 million individuals (NOAA 2010f). Striped dolphins are usually found in tight, cohesive groups averaging between 25 and 100 individuals, but herds can be into the thousands (NOAA 2010f; OBIS 2010d). Surface behavior is often characterized as sociable, athletic, energetic, active, and nimble with rapid swimming (NOAA 2010f).

Striped dolphins are thought to be polygynous. Males become sexually mature between 7 to 15 years and females 5 to 13 years. Interval between births is usually 3 to 4 years. Females give birth during the summer or autumn, after a gestation period of approximately one year. Lactation usually lasts 12 to 18 months (NOAA 2010f). Striped dolphins are capable of diving up to at least 2,300 feet (700 meters). Diet consists of various species of relatively small, closely packed, midwater, benthopleagic and/or pelagic shoaling/schooling fish (e.g., myctophids and cod) and cephalopods (e.g., squid and octopus) (NOAA 2010f; OBIS 2010d).

Risso’s Dolphin (*Grampus griseus*)

Off the northeast United States coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and autumn. In winter, the range is in the Mid-Atlantic Bight and extends outward into oceanic waters. In general, the population occupies the mid-Atlantic continental shelf edge year round and is rarely seen in the Gulf of Maine. This species is known to be associated with strong bathymetric features, Gulf Stream warm-core rings, and the Gulf Stream north wall (Waring et al. 2009).

Total numbers of Risso’s dolphins off the United States and Canadian Atlantic coasts are unknown. The two 2004 United States Atlantic surveys estimates the total number for Risso’s dolphins is 20,479 individuals, with the estimate from the northern United States Atlantic at 15,053 and from the southern United States Atlantic at 5,426 (Waring et al. 2009). The Risso’s dolphin population worldwide is estimated at approximately 300,000 individuals (NOAA 2010g).

Not much is known about the reproduction of Risso's dolphin. Breeding and calving may occur year-round, and the gestation period is approximately 13 to 14 months. The peak of the breeding and calving season may vary geographically (especially in the North Pacific), with most animal births occurring from summer to fall in Japanese waters, and from fall to winter in California waters (NOAA 2010g). Risso's dolphins are capable of diving to at least 1,000 feet (300 meters) and holding their breath for 30 minutes, but typically make shorter dives of 1 to 2 minutes (NOAA 2010e). Their diet consists of fish (e.g., anchovies), krill, and cephalopods (e.g., squid, octopus, and cuttlefish) and they feed mainly at night when their prey is closer to the surface (NOAA 2010g; OBIS 2010e).

White-Sided Dolphin (*Lagenorhynchus acutus*)

This species inhabits waters from central West Greenland to North Carolina (about 35°N) and perhaps as far east as 43°W. White-sided dolphin exhibits seasonal movements, moving closer inshore and north in the summer, and offshore and south in the winter (Waring et al. 2009; NOAA 2010h).

The total number of white-sided dolphins along the eastern United States and Canadian Atlantic coasts is unknown. In 2007, the best available abundance estimate for white-sided dolphins in the western North Atlantic stock was 63,368 individuals (Waring et al. 2009). Atlantic white-sided dolphins are highly social and playful animals. They have been seen traveling in small groups of a few individuals and in large aggregations of up to 500 animals. Older immature individuals are not generally found in reproductive herds that have mature females and young. White-sided dolphins are commonly observed engaging in acrobatic activities, such as lobtailing and breaching (NOAA 2010h; OBIS 2010f).

Females reach sexual maturity at around 6 to 12 years and males at around 7 to 11 years. Females typically give birth to a single calf about every other year. The breeding season is from May to August, though most calves are born in June and July. Calves are born in summer with a peak in June and July after a gestational period of 10 to 12 months, and lactation may last 18 months. Stranded females show evidence that lactation and pregnancy overlap (NOAA 2010h; OBIS 2010f). White-sided dolphins dive to feed on prey. Diet consists of fish (e.g., mackerel, herring, and hake), squid, and shrimp. They are often seen in association with long-finned pilot whales, humpback whales, and fin whales while feeding (NOAA 2010h; OBIS 2010f).

8.3.1.2 Pinnipeds

Harbor Seal (*Phoca vitulina*)

This species is found from the Canadian Arctic to southern New England, New York and occasionally in the Carolinas (NOAA 2009b; Waring et al. 2009). Western North Atlantic stock harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine, and occur seasonally from the southern New England to New Jersey coasts from September through late May (Waring et al. 2009). A general southward movement from the Bay of Fundy to southern New England waters occurs in autumn and early winter. A northward movement from southern New England to Maine and eastern Canada occurs prior to pupping season, which takes place from mid-May through June along the Maine coast (Waring et al. 2009). Stranding reports from 2006 to 2007 for the coastal waters of Long Island, Staten Island, and the New York City area showed a total of 16 harbor seal standings occurred (RFMRP 2008), although none of these were in the vicinity of the HVDC Transmission System.

Harbor seals live in temperate coastal habitats and can be found commonly in bays, rivers, estuaries, and intertidal areas (OBIS 2009b), with movements associated with tides, weather, season, food availability, and reproduction. This species uses rocks, reefs, beach, and drifting glacial ice as haul out and pupping sites. Haul out on land is needed for rest, thermal regulation, social interaction, to give birth, and to avoid predators. Studies have shown that seals in groups tend to spend less time scanning for predators than those that haul out alone (NOAA 2009b).

Harbor seals are generalist feeders, taking a wide variety of fish, cephalopods, and crustaceans from surface, mid-water, and benthic habitats. Although primarily a coastal species, dives over 500 meters have been recorded (NOAA 2009b; OBIS 2009b). In United States waters, breeding and pupping normally occurs in waters north of the New Hampshire/Maine border and females give birth during the spring and summer (Waring et al. 2009). Pupping season varies with latitude. Pups are nursed for an average of 24 days and are ready to swim immediately after birth (NOAA 2009b).

Gray Seal (*Halichoerus grypus*)

The Western North Atlantic stock of gray seal ranges from North Labrador down to New England and occasionally as far south as Virginia (MarineBio 2009; SNMNH 2009; Waring et al. 2009). In the mid 1980s, small numbers of animals and pupping were observed on several isolated islands along the Maine coast and in Nantucket-Vineyard Sound, Massachusetts (Waring et al. 2009). Stranding reports from 2006 to 2007 for the coastal waters of Long Island, Staten Island, and the New York City area showed a total of 18 gray seal strandings occurred (RFMRP 2008), although none of these were in the vicinity of the HVDC Transmission System

Current estimates of the total Western Atlantic gray seal population are not available; although estimates of portions of the stock are available for select time periods. For the Canadian population, the 1993 survey estimated the population at 144,000 individuals, the 1997 survey estimated the population at 195,000 individuals, and the 2004 survey had an estimated range between 208,720 to 223,220 individuals, depending on the model used (Waring et al. 2009). The gray seal population in United States waters is also increasing. Maine coast-wide surveys conducted during the summer documented 597 individuals in 1993 and 1,731 individuals in 2001 (Waring et al. 2009). Gray seal numbers are increasing in Massachusetts at Muskeget Island off the coast of Nantucket, and at Monomoy Island, off the coast of Chatham, Cape Cod. Pup counts on Muskeget have increased from 0 in 1989 to 1,023 in 2002. No gray seals were recorded at haul out sites between Newport, Rhode Island and Montauk Point, New York (Barlas 1999), although, more recently small numbers of gray seals have been recorded in this region (Waring et al. 2009).

Gray seals feed on a wide variety of benthic and demersal prey items in coastal areas. They also feed on schooling fish in the water column, and occasionally take seabirds. Prey species taken include: sand lance, whiting, saury, smelt, various kinds of skates, capelin, lumpfish, pollock, cod, haddock, saithe, plaice, flounder, salmon, and a variety of cephalopod and molluscan invertebrates. This species can dive to about 30 to 70 meters while feeding and cannibalism by adult males on pups has also been reported (MarineBio 2009; OBIS 2009c).

Gray seals are usually solitary or found in small dispersed groups. They are commonly observed resting at the surface in a vertical "bottle" position, treading water with only the head and upper neck exposed (OBIS 2009c). The maximum depth of dives for this species is approximately 300 meters, lasting up to 30 minutes, with most dives up to 60 meters or less and ranging from 1 to 10 minutes (MarineBio 2009; OBIS 2009c).

Gray seals gather together for hauling out, breeding, and molting. Many, but not all gray seals disperse from their rookeries during the non-breeding season and gather again at traditional sites to haul-out for the annual molt (OBIS 2009c). They are usually quite gregarious at haul-outs with groups of 100 or more being common, and they will share haul-outs with harbor seals (OBIS 2009c). The breeding season varies between populations, generally taking place between mid-December and early February in Canada (MarineBio 2009; OBIS 2009c). Breeding territories also vary by population in the Atlantic and are established on rocky islands and coasts, in caves, sandy islands, and beaches (MarineBio 2009). Females reach sexual maturity at 3 to 5 years and males at 4 to 6 years, although males may not attain territorial status until 8 to 10 years of age (MarineBio 2009). Females usually give birth at the rookery about a day after coming ashore and pups nurse for about 17 to 18 days before they are weaned and left to fend for themselves.

Harp Seal (*Phoca groenlandica*)

Harp seal occurs throughout much of the North Atlantic and Arctic Oceans, and vagrants are known to reach New England and New York (Waring et al. 2009; OBIS 2010g). The largest stock is located off eastern Canada and is divided into two breeding herds. In recent years, numbers of sightings and strandings have been increasing off the east coast of the United States from Maine to New Jersey. These extralimital appearances usually occur from January to May, when the western North Atlantic stock of harp seals is at its most southern point of migration (Waring et al. 2009; NOAA 2010b). Stranding reports from 2006 to 2007 for the coastal waters of Long Island, Staten Island, and the New York City area showed a total of 26 harp seal strandings occurred (RFMRP 2008), although none of these were in the vicinity of the HVDC Transmission System

Harp seals are highly migratory. Breeding occurs at different times for each stock between mid-February and April. Adults assemble north of their whelping patches to undergo the annual molt. The migration then continues north to Arctic summer feeding grounds. In late September, after a summer of feeding, nearly all adults and some of the immature animals of the western North Atlantic stock migrate southward along the Labrador coast, usually reaching the entrance to the Gulf of St. Lawrence by early winter (Waring et al. 2009; NOAA 2010b).

Aerial surveys and mark-recapture methods have been used to calculate the population size. The methods involve surveying the whelping concentrations and estimating total population adult numbers from pup production. Results of the 2004 survey estimated the population size at approximately 5.5 million individuals (Waring et al. 2009). Based on the increased number of stranded harp seals in United States waters, the population appears to be increasing in the United States, but the magnitude of the suspected increase is unknown (Waring et al. 2009).

During extensive seasonal migrations, large groups of harp seals may feed and travel together. When molting in late spring, harp seals aggregate in large numbers of up to several thousand seals on the pack ice (NOAA 2010b; OBIS 2010g). Females give birth to pups near the southern limits of their range from late February to mid-March. Harp seal pups are abruptly weaned from their mothers when they weigh approximately 80 pounds (36 kg). Adult females leave their pups on the ice where they remain without eating for approximately six weeks. After pups are weaned and left alone, adult harp seals begin mating. Adult females undergo a period of suspended development known as "delayed implantation" during which embryos do not attach to the uterine wall for three months or more. This allows all females to give birth during the limited period of time when pack ice is available (NOAA 2010b).

Harp seals are modest divers compared to other pinnipeds. The average maximum dive is to about 1,200 feet (370 meters), with lasting approximately 16 minutes (NOAA 2010b; OBIS 2010g). Their diet consists of a variety of crustaceans and fishes. Capelin, arctic and polar cod are preferred prey fish, and the preferred invertebrate is krill (NOAA 2010b; OBIS 2010g).

Hooded Seal (*Crystophora cristata*)

Hooded seals are found in the Arctic Ocean and in high latitudes of the North Atlantic. The four major breeding and molting grounds are: Gulf of St. Lawrence, off the coast of Newfoundland and Labrador, Davis Strait, and the Norwegian Sea, near Jan Mayen Island (NOAA 2010c; OBIS 2010h). Hooded seals are abundant in these areas during the mating season, which begins in late winter and lasts through April before individuals disperse for the summer and fall. This species is migratory and can wander long distances, occasionally found as far south as Florida, California, and the Caribbean (NOAA 2010c).

In 2005, surveys were conducted to assess population sizes in the main hooded seal habitats. The estimated number of hooded seal pups was 15,200 in Greenland and 116,900 in the Northwest Atlantic. Using these data, the total population of hooded seals was estimated to be 592,100. Data on pup production over many years indicate that population size has been increasing since the 1980s, but not enough information is available to make reliable assertions of population growth (NOAA 2010c).

The hooded seal is an unsocial species and is more aggressive and territorial than other seals, migrating and remaining alone for most of the year except during the mating season. Females mature in about 3 to 6 years and males in 5 to 7 years. They gather in the spring at their usual breeding grounds for 2 to 3 weeks and produce offspring, after which time they linger in the area to molt, then begin their annual period of migration for the remainder of the year (NOAA 2010c). Mating usually occurs in the water (OBIS 2010h). Hooded seal pups are weaned between 3 to 5 days, the shortest time of any known mammal. After they are weaned, pups begin to find food alone, mainly feeding on crustaceans, and improve their swimming and diving skills. There are limited data and observations for juvenile hooded seal, because they appear to spend a great amount of time in the water and in remote areas (NOAA 2010c; OBIS 2010h).

Hooded seals are deep divers and are capable of long dives. The maximum recorded depth reached is over 3,280 feet (1,000 meters) and the longest dive has been nearly one hour. Typical dives while foraging are to depths of 325 to 1,950 feet (100 to 600 meters) and last around 15 minutes (NOAA 2010c; 2010h). Their diet is poorly known, but appears to consist primarily of squid, starfish, mussels, and fish such as Greenland halibut, redfish, cod, capelin, and herring (NOAA 2010c; OBIS 2010h).

8.3.2 Avoidance and/or Minimization of Potential Impacts

Marine mammals are generally expected to be infrequently present and in low densities in the Facility area, primarily occurring in the Long Island Sound, and, as such, the impacts, if any, will be insignificant. Most marine mammals are expected to move away from the Facility construction zone during construction activity. Trenching activities associated with cable installation may cause a temporary and localized period of increased turbidity. However, the increase in turbidity is expected to be minor and would not affect the ability of marine mammals to navigate the area and their ability to feed in surrounding, unaffected areas. There will be insignificant impacts on marine mammals that feed on more motile epifaunal organisms (e.g., crabs, mysids, and sand shrimp) or fish, since these organisms will begin to re-occupy the trenched area immediately after construction. For this reason, it is expected that the marine mammal species in the Facility area will continue to feed there even after trenching. The activities in the Facility area may have a short-term benefit to some marine mammals. Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the lower Bay of New York Harbor and found that during dredging, and immediately after an area has been dredged, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom.

Placement of rip-rap or concrete mats at utility crossings will cause insignificant changes in substrate characteristics. Non-burial areas are likely to occur where rocky and bedrock substrates exist and the mats will provide a comparable habitat structure. In mud and sand substrates the mats will create small patch reefs. The rip-rap or concrete mats will provide additional new habitat for epibenthic organisms to colonize and provide areas of shelter, structure, or cover typically sought by fish for protection from predators (Johnson and Stickney 1989; Ogden 2005), which may attract marine mammal species.

During the installation and construction of the underwater cables, a number of vessels, including tugs, barges, cranes, and workboats will be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials; therefore, the potential exists for an accidental spill. BMPs will be employed throughout construction process and an appropriate spill response will be implemented in the case of an accidental spill, to limit the impacts from oil and fluid spills. The navigable waters of the proposed cable route are frequented by various vessels on a daily basis; therefore, introduction of construction vessels to the area during the construction period will represent an insignificant increase in the potential for an oil or fluid spill compared to existing conditions.

Potential impacts on marine mammal species from underwater noises during construction activities will be insignificant. There are many natural and anthropogenic sources of ambient noise in the environment. Natural sources include wind, wave/tidal action, cracking ice, and marine life. Anthropogenic or human-generated noise may include recreational and commercial ship traffic, dredging, construction, oil drilling and production, and geophysical surveys (EIA 2008).

Marine mammals rely on sound for many aspects of their lives, including reproduction, feeding, predator and hazard avoidance, communication, and navigation (Weilgart 2007). There is considerable variation among marine mammals in both absolute hearing range and sensitivity. Their composite range is from ultrasonic (frequencies greater than 20 kilohertz [kHz]) to infrasonic (frequencies less than 20 Hertz [Hz]). Harbor porpoise have a wide hearing range and the highest upper-frequency limit of all odontocetes studied. They have a hearing range of 250 Hz–180 kHz with maximum sensitivity between 16 and 140 kHz (USACE 2008). Direct hearing measurements, for the most part, are not available for cetacean species, but it is generally believed that a whale's hearing range is related to the range of sound it produces (LGL and JASCO Research 2005). Behavioral responses of marine mammals to sound vary greatly and depend on a number of factors. An individual's hearing sensitivity, tolerance to noise, exposure to the same noise in the past, behavior at the time of exposure, age, sex, and group composition all affect how it may respond. Sometimes it is difficult to know whether observed changes in behavior are due to sound or to other causes. Not all changes in behavior are cause for concern. Observations suggest that marine mammals tend over time to become less sensitive to those types of noise and disturbance to which they are repeatedly exposed (Richardson et al. 1995).

Studies have shown displacement from critical feeding and breeding grounds in a number of marine mammal species exposed to seismic noise, as well as changes in diving and foraging behavior where cetaceans have been observed to avoid and feed less, mysticetes observed to spend more time at the water surface, and smaller odontocetes observed to swim faster (Weilgart 2007). From 1996 to present, the RFMRP cetacean and pinniped strandings and sightings in the nearshore waters of Long Island Sound have occurred mostly in the open Atlantic open section, or the southern shores of Long Island, with cetacean (Figure 8-1) and pinniped (Figure 8-2) strandings and sightings in the Hudson River being uncommon. Underwater noise from construction will be short-term, temporary, and will not involve pile driving. Due to the limited presence of cetaceans and pinnipeds in the Hudson River, potential impacts and underwater noise impacts to marine mammals are expected to be insignificant.

Although their presence is infrequent in the Facility area, construction vessels associated with cable installation could potentially collide with cetaceans and pinnipeds. The vessels used by the Applicants will operate at slow speeds during construction, to avoid and/or minimize the potential for collision with marine mammals.

8.4 Wildlife Protected Areas and Conservation Lands

This section describes Wildlife Management Areas ("WMAs"), Game Lands, Marine Protected Areas, and any other designated lands that are protected primarily for the conservation of fish or wildlife habitat.

8.4.1 Marine and Aquatic Protected Areas

The HVDC Transmission System route does not pass through any SCFWHs within Lake Champlain. The cable route directly intersects five SCFWHs (Figure 8-3) as determined by the NYSDOS Division of Coastal Resources and the NYSDEC within the Hudson River south of Albany. From north to south, the proposed cable crosses the following significant habitats:

Esopus Estuary, Kingston Deepwater, Poughkeepsie Deepwater Habitat, Hudson River Mile 44-56, and the lower Hudson Reach. The route does not cross the Vanderburg Cove and Shallows SCFWH or the Esopus Meadows SCFWH but, as they are adjacent to the Kingston Deepwater SCFWH, they are discussed at the same time as the intersected SCFWH. Additionally, the HVDC Transmission System is within the Hudson River in the vicinity of 12 SCFWHs. These adjacent SCFWHs are discussed in Section 8.4.1.2.

8.4.1.1 Significant Coastal Fish and Wildlife Habitats Crossed

<u>Esopus Estuary</u>

Esopus Estuary, containing one of the primary freshwater tributaries of the Hudson River, was designated a SCFWH in 1987 (Figure 8-3 Sheet 1 of 3). The estuary is a 700-acre area including freshwater tidal wetlands and littoral zone areas, and a deepwater section of the Hudson River. The Esopus Estuary SCFWH contains a complex of natural estuarine communities at the mouth of a major freshwater tributary of the Hudson River. The deepwater area is recognized as a post-spawning and wintering habitat for shortnose sturgeon. The littoral zone of the Hudson River adjacent to the creek mouth is also an important spawning ground for shad and serves as a spawning, nursery and feeding area for striped bass, white perch, herring, smelt, and most of the resident freshwater species. Esopus Estuary also contains a number of shallow water habitats, but the proposed cable route avoids the Esopus river mouth and associated fresh-tidal wetlands and littoral zone areas.

<u>Kingston Deepwater, Vanderburg Cove and Shallows, and Esopus Meadows Habitats</u>

Kingston Deepwater Habitat, the northernmost extensive section of deepwater habitat in the Hudson River, was designated a SCFWH in 1987 (Figure 8-3 Sheet 2 of 3. The Kingston Deepwater SCFWH area contains six miles of continuous deep water from 30 feet deep to in excess of 50 feet deep. This deep water provides wintering habitat for shortnose sturgeon and supports spawning of sturgeon as well. With spawning occurring in this area, juveniles would also likely make use of this habitat. In addition, the higher salinity water in this deep section of the Estuary during summer low flows supports the upstream penetration of marine species in the Estuary.

<u>Poughkeepsie Deepwater Habitat</u>

The Poughkeepsie Deepwater Habitat was designated a SCFWH in 1987 (Figure 8-3 Sheet 2 of 3. The Poughkeepsie Deepwater SCFWH area is a 14-mile reach of the Estuary containing a river bottom trench ranging from 30 feet deep to 50 feet deep over most of the area. A maximum depth in excess of 125 feet occurs at Crum Elbow. This reach is spawning and wintering habitat for shortnose sturgeon, and marine fish species take advantage of the higher salinity water in the depths during low summer flows. The occurrence of larval shortnose sturgeon in this reach suggests that it may be important for juveniles of this species.

Hudson River Mile 44-56

Hudson River mile 44-56 was designated a SCFWH in 1987 (Figure 8-3 Sheet 3 of 3). Hudson River Mile 44-56 SCFWH is an approximate 12-mile reach of the Estuary where it passes through the Hudson Highlands. This is a narrow reach with very deep water, strong currents, and extensive rocky bottom substrate. This reach is biologically significant because it remains freshwater throughout the early summer and is a spawning area for striped bass and other anadromous species. The early juveniles of these species are carried through this reach to the productive shallows of Haverstraw Bay, Croton Bay, and the Tappan Zee. In addition, this is a migration corridor for species moving upstream to the upper Estuary. This deepwater area is recognized as a spawning area for striped bass and occupied wintering habitat for shortnose sturgeon, an endangered species in the Hudson Estuary.

The recent survey of the cable route, including sub-bottom profiling, suggests that rock outcroppings are present in this reach of Estuary which may prevent burial of the cables in some locations. More refined profiling of the bottom would likely be undertaken before final placement of the cables. Where the cables cannot be buried, they would be laid across the bottom and covered with grout filled mattresses to protect them.

Hudson River mile 44-56 is also a SCFWH for the concentration of wintering bald eagles (see Section 9 for information on TE species). This section of the Hudson River rarely freezes and the upwellings along the river shoreline bring fish concentrations near the surface, providing a dependable prey base for the eagles. Bald eagles have been reported in this area since 1981 with as many as 12 birds occurring here at one time. Winter residence generally extends from December through March, with Iona Island being a primary roosting area. Other roosting areas for the eagles include undisturbed woodlands along both sides of the river, especially near sheltered coves (NYSDOS 2004).

Lower Hudson Reach

The Lower Hudson Reach was designated a SCFWH in 1992 (Figure 8-3 Sheet 3 of 3). The Lower Hudson Reach is one of only a few large tidal river mouth systems in the northeastern United States; therefore it provides a unique range of salinity and other estuarine features. Salinity in this brackish environment ranges from 3.8 ppt to 18.7 ppt depending on the location of the saltfront, which varies with the seasons. Concentrations of wintering striped bass and winter flounder are found in the area. Striped bass are known to spawn above river's salt front between West Point and Kingston from April to mid-June, with the semi-buoyant eggs found in greatest concentration from mid-May to early June and larvae transforming to juvenile between late June and early July (NYSDOS 2004).

In addition to striped bass, significant numbers of summer flounder, white perch, Atlantic tomcod, Atlantic silversides, bay anchovy, hogchokers, American shad, blue crabs, and American eel have been found (NYSDOS 2004). The narrative states that this area of the river "may also be important for bluefish and weakfish young of year and both Atlantic sturgeon and shortnose (adult only) sturgeon" (NYSDOS 2004). Animals of the lower trophic levels are also present in substantial numbers in the Lower Hudson Reach, including copepods, rotifers, mysid shrimps, nematodes, oligochaetes, polychaetes, and amphipods. Mid-winter aerial survey between 1986 and 1990 showed an average of 1,619 canvasback, 281 scaup, and lesser numbers of mergansers, mallards, and Canada geese overwinter in the Lower Hudson Reach (NYSDOS 2004).

8.4.1.2 Other Significant Coastal Fish and Wildlife Habitats

The HVDC Transmission System is in-water in the vicinity of the following 12 SCFWHs. The routing, as agreed upon in the settlement documents, would avoid transiting these areas and, as such, they are not discussed in detail.

- Germantown-Clermont Flats
- North and South Tivoli Bays
- The Flats
- Rondout Creek
- Wappinger Creek
- Fishkill Creek
- Constitution Marsh
- Moodna Creek
- Iona Island Marsh
- Croton River and Bay
- Piermont Marsh
- North and South Brother Islands

8.4.2 Terrestrial Wildlife Management Areas and other Conservation Lands

The Applicants have identified two protected lands that are adjacent to the underground transmission cable corridors and that have wildlife conservation and/or recreational activities associated with wildlife as a primary function: Wilton Wildlife Preserve and Five Rivers Environmental Education Center (see Section 2 for more detailed descriptions of these areas). These public lands abut the railroad right-of-way; however, since the Applicants anticipate that the underground cable corridor will remain within the existing railroad-right-of-way, no impacts to these lands are expected.

Wilton Wildlife Preserve and Park is a set of parcels protected through a partnership between the NYSDEC, the Town of Wilton, and The Nature Conservancy. The Wilton Wildlife Preserve and Park is adjacent to the Facility on both sides of the railroad right-of-way between approximate MPs 144.7 and 146 of the underground transmission cable corridor. The main goals of the park are passive recreation, the preservation and restoration of habitat for Karner Blue Butterfly (see Section 9), open space protection, and education (Wilton Wildlife Preserve and Park, Inc. 2010).

Five Rivers Environmental Education Center is designed as an outdoor nature museum that offers opportunities for wildlife observation, recreation, and educational programs. This center abuts the east side of the railroad right-of-way between approximate MPs 191 and 193, within the Town of New Scotland in Albany County.

8.4.3 Avoidance and/or Minimization of Potential Impacts

8.4.3.1 Marine and Aquatic Protected Areas

It is expected that that potential, temporary impacts from the cable installation will be limited to the bottom habitat along the underwater cable route, during water jetting, trenching, and/or anchoring of vessels. Temporary impacts on bottom sediments during cable installation may result in increased turbidity and re-suspension of any sediment contaminants, but these impacts should be short-term and localized to areas of bottom disturbance. See Section 7.0 for a description of benthic habitats and avoidance and/or minimization measures.

Potential impacts due to the temporary impacts of bottom sediments will be avoided and/or minimized by using water jetting methods and HDD techniques. Water jetting fluidizes the sediments along the directed route, allowing the cable to embed itself (i.e., sink) within the substrate. Fluidized sediments are contained largely within the confines of the trench wall, allowing the trench to backfill immediately.

During the installation and construction of the cables, a number of vessels, including tugs, barges, cranes, and workboats may be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials with the potential for a spill. Additionally, an inadvertent release of drilling fluids could potentially occur at the HDD entry or exit locations. BMPs and a SPCC Plan or its equivalent will be employed throughout construction and an appropriate spill response will be implemented in the case of a spill to avoid and/or minimize impacts from any potential oil and fluid spills. The navigable waters of the proposed cable route are frequented by various vessels on a daily basis; therefore, introduction of construction vessels to the area during the construction period will represent an insignificant increase in the potential for an oil or fluid spill compared to existing conditions.

Impacts to the intersected SCFWHs have been avoided and/or minimized through the adaption of seasonal construction windows (see Table 8-2). These windows allow construction to occur when the sensitive habitats are not utilized by sensitive species. This construction schedule was developed in direct consultation with the NYSDEC. In addition, the NYSDEC has identified those areas of particular significance within the intersected SCFWHs and these zones will be avoided to the maximum extent possible. The temporary and localized impacts on water quality and turbidity within the habitat will be insignificant because cable installation will occur some distance from the SCFWHs. Turbidity plumes are not expected to extend over long distances and are not expected to result in any type of barriers to fish movement. Additionally, cable installation may temporarily disturb the substrate within the Hudson River; however, this disturbance is expected to occur over a short time period in any one location given the speed at which water jetting occurs and will be localized to the immediate area of the water jetting device or conventional dredge trenching operations. No losses of habitat or permanent impacts are expected from the underwater cable installation. Insignificant impacts to habitat may occur at utility crossings where concrete mats or rip-rap will be placed for short distances over the cables.

Esopus Estuary

There is expected to be an insignificant or no impact to the Esopus Estuary. Construction windows have been established to avoid times that the habitat is utilized by sensitive fish species. Shortnose sturgeon favors the channel areas of the Hudson and has been shown to use both naturally deep and dredged channels. Cable installation would not alter channel depths or existing current regimes. These factors as well as the re-establishment of the substrate will not impact the use of this habitat for sturgeon.

Kingston Deepwater, Vanderburg Cove and Shallows, and Esopus Meadows Habitats

There are expected to be insignificant temporary impacts to the Kingston Deepwater Habitat during cable installation. It is expected that a slight, temporary degradation to water quality may occur; however, the effects on water quality and turbidity within the deepwater area will be insignificant. Construction windows have been established to avoid times that these habitats are utilized by fish species. Shortnose sturgeon favors the channel areas of the Hudson and has been shown to use both naturally deep and dredged channels. Cable installation would not alter channel depths or existing current regimes, and following re-establishment of the substrate, there will be no impact to the use of this habitat for sturgeon.

Poughkeepsie Deepwater Habitat

A slight, temporary degradation to water quality within the area may occur during cable installation. The effects on water quality and turbidity within the deepwater area of the habitat are expected to be insignificant. The Poughkeepsie Deepwater is recognized as spawning and wintering habitat for shortnose sturgeon. Because sturgeon may be using this reach much of the year, installation windows have been established to be timed with the lowest anticipated use of this area. Shortnose sturgeon favors the channel areas of the Hudson and has been shown to use both naturally deep and dredged channels. Cable installation would not alter channel depths or existing current regimes, and following re-establishment of the substrate, use of this habitat by sturgeon would be unimpacted.

Hudson River Mile 44-56

An insignificant impact on water quality during cable installation may occur, but will not result in substantially degraded water quality. Potential temporary increases in turbidity and sedimentation exist during cable installation, depending on sediment type. Construction windows have been established to avoid the seasonal use of the area by striped bass and shortnose sturgeon. Shortnose sturgeon favors the channel areas of the Hudson and has been shown to use both naturally deep and dredged channels. Cable installation would insignificantly alter channel depths where mattresses are used to protect the cables, but existing current regimes would remain unchanged. The current regimes and re-establishment of the substrate where the cable is buried will not impact the use of this habitat for striped bass and sturgeon.

<u>Lower Hudson Reach</u>

This segment of the river has been heavily impacted by filling and development activities but continues to support benthic, planktonic, and pelagic species. Construction windows have been established to avoid seasonal uses of the area by fish species, particularly the winter season which has the highest seasonal use. Shortnose sturgeon favors the channel areas of the Hudson and has been shown to use both naturally deep and dredged channels. Cable installation would not alter channel depths or existing current regimes, and following re-establishment of the substrate there will no impact of the use of this habitat for fish species.

8.4.3.2 Terrestrial Wildlife Management Areas and other Conservation Lands

Since the Applicants intend to construct the underground portion of the Facility within existing easements for the railroad right-of-way, the Facility will not result in any impact to lands protected as part of the Wilton Wildlife Preserve and Park or the Five Rivers Environmental Education Center. During construction, some noise may be audible in adjacent parcels, which may have the potential to temporarily impact wildlife and recreational users in lands adjacent to the construction corridor. This impact will be localized to the immediate area adjacent to the right-of-way and will last only during active construction. The Applicants will implement appropriate BMPs in order to avoid and/or minimize any offsite impacts to habitats outside of the construction corridor, such as limiting the clearing of woody vegetation to the minimum required for construction, installing erosion and sediment controls adjacent to the construction corridor, as needed, stabilizing soils as soon as possible following the completion of construction activities, and implementing spill prevention, control and mitigation measures.

9.0 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (“ESA”), which is administered jointly by the United States Fish and Wildlife Service (“USFWS”) and the fisheries division of the National Oceanic and Atmospheric Administration (“NOAA”), protects species designated as threatened or endangered in the United States at the federal level. NOAA has primary responsibility for anadramous species, while USFWS administers the ESA with regard to most other terrestrial and freshwater species. In addition, these agencies designate “candidate species,” under the ESA, which are species that are warranted for listing under the ESA but precluded from listing at the time by higher listing priorities.

The mission of the New York State Department of Environmental Conservation’s (“NYSDEC”) Endangered Species Program is to perpetuate and restore native animal life within New York State for the use and benefit of current and future generations, based upon sound scientific practices and in consideration of social values, so as not to foreclose these opportunities to future generations (NYSDEC 2009d). In New York State, threatened and endangered wildlife species are listed under 6 NYCRR Part 182.6, which also includes species designated as threatened or endangered under the ESA (collectively, “TE species”) Part 182 also lists “species of special concern,” which are native to New York and merit some less stringent protection based on a non-cyclical decline in population, vulnerability, restricted range or federal listing as a candidate species, among other factors. The NYSDEC also classifies rare, threatened and endangered plant species under 6 NYCRR Part 193, which also includes federally designated threatened and endangered plants (collectively, "RTE plants").

This section describes TE species, RTE plants, New York species of special concern and federal candidate species that may occur in terrestrial and/or aquatic habitats within or near the Facility area. This section also describes the potential impacts to TE species, RTE plants, federal candidate species, and New York species of special concern that may result from the construction and operation of the Facility and the methods that will be used to avoid and/or minimize potential impacts, particularly for TE species and their occupied habitats and RTE plants. The protective measures for TE species and RTE plants are further detailed in Best Management Practices that have been developed.

The Facility includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within Lake Champlain, the Hudson River, Harlem River and the East River. The majority of the terrestrial portions of the Facility are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; (6) the Luyster Creek converter station area in Astoria; and (7) the approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation. From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority ("NYPA").

The potential presence of TE species, RTE plants, federal candidate species and New York species of special concern and/or habitat for these species within or in the vicinity of the Facility Construction Zone was determined through a review of available publications and databases maintained by the NYSDEC, USFWS and NOAA. Additionally, the Applicants initiated discussions with the NYSDEC, NYNHP, USFWS, and NMFS regarding the potential for TE species and their occupied habitats or RTE plants to occur in the vicinity of the Facility. Coordination regarding these matters will continue with these agencies as part of the federal permitting review process for the Facility.

9.1 Fish Species

9.1.1 Existing Conditions

This section summarizes TE species of fish, and one federal candidate species, in Lake Champlain and Hudson River that occur or may potentially occur within the underwater transmission cable route. The Applicants will work with appropriate federal and state agencies (i.e., USFWS, NOAA, DOE and NYSDEC) to ensure that TE species of fish species, if any, that may occur in the area of the underwater transmission cable route are identified and that any necessary avoidance and/or minimization measures are implemented.

In addition to the threatened and endangered fish species listed in Table 9-1, the NYSDEC online Natural Heritage Program – Natural Explore Database identified several threatened, endangered, and species of special concern fish species within the county and watershed of the proposed HVDC Transmission System route but are not expected to occur in the vicinity of the HVDC Transmission System based on specific habitat requirements and historical captured data. The fish species identified by the NYSDEC Natural Explorer Database include round whitefish (*Prosopium cylindraceum*) (endangered), lake chubsucker (*Erimyzon sucetta*) (threatened), banded sunfish (*Enneacanthus obesus*) (threatened), mud sunfish (*Acantharchus pomotis*) (threatened), and ironcolor shiner (*Notropis chalybaeus*) (special concern) (NYSDEC 2009d and 2010m). Due to the specific habitat requirement and utilization, as well as historical captured data, these fish species are not expected to occur within the vicinity of the proposed HVDC Transmission System.

Below are the species and habitat descriptions for the TE species and one federal candidate species of fish known to occur in the vicinity of the HVDC Transmission System.

9.1.1.1 Lake Champlain

Lake Sturgeon (*Acipenser fulvescens*)

Lake sturgeon is listed as a threatened species in the State of New York. Lake sturgeon is New York State's largest completely freshwater fish. However, this species can also occur in the brackish waters of Hudson Bay and the St. Lawrence River. Lake sturgeon prefer clean sand, gravel, or rock bottom areas where food is abundant (Stegemann 1994). Lake sturgeons were so abundant that they were once considered a trash fish. Commercial fishermen found them to be a nuisance because their tough skin would ruin nets (Stegemann 1994). But as the value of their eggs for caviar, skin for leather, swim bladder for isinglass, and delicious meat became known, the Great Lake fishery exploded and within a relatively short time, the population levels plummeted (Stegemann 1994).

Mature adults average between 3 and 5 feet in length and 10 to 80 pounds in weight, but can occasionally grow as large as seven plus feet and 300 plus pounds (Stegemann 1994). Female lake sturgeon reach sexual maturity between 14 to 23 years old, and may live up to 80 years. Once sexual maturity is reached, females will only spawn every four to six years. Male lake sturgeon reach sexual maturity at eight to 19 years old (Stegemann 1994). Spawning takes place during the spring from May to June. Prior to spawning, this species congregates in deep holes near the spawning site and perform "staging" displays that include rolling near the bottom and then leaping out of the water. Spawning usually takes place in areas of clean, large rubble such as along the windswept rocky shores and in the rapids in streams. Eggs are scattered by currents and sticks to rock and logs (Stegemann 1994). The preferred diet of lake sturgeon includes leeches, snails, clams, other invertebrates, small fish, and even algae (Stegemann 1994).

The population of lake sturgeon in Lake Champlain has declined due to overharvest and loss of access to spawning habitats from dam construction. Spawning adults, as well as lake sturgeon eggs have been documented in historic spawning grounds in the Missisquoi, Lamoille, and Winooski rivers, along the eastern side of Lake Champlain (FTC 2009).

Mooneye (*Hiodon tergisus*)

The mooneye is listed as a threatened species in the State of New York. The mooneye is a medium-size freshwater fish that reaches 11 to 15 inches in length and one to two pounds in weight (NYSDEC 2009e). Males typically reach sexual maturity in three years, and females often do not reach sexual maturity until five years old (NatureServe 2009). Spawning occurs during the spring, where sexually mature adults migrate into medium to large-size rivers from March through May to deposit eggs (NYSDEC 2009e; NatureServe 2009). Eggs are usually deposited over rocks in swift water areas (NYSDEC 2009e), and most larvae are collected from near-surface waters at night (NatureServe 2009).

This species prefers clear water habitat of large streams, low and moderate gradient rivers, and deep and shallow sections of lakes (NatureServe 2009; NYSDEC 2009e). Adults and juveniles prey mainly on aquatic and terrestrial insects and also crustaceans, mollusks, and small fishes (NatureServe 2009; NYSDEC 2009e). While the exact cause the species population decline is not known, siltation and competition with introduced species are possible factors (NYSDEC 2009e).

Eastern Sand Darter (*Ammocrypta pellucidum*)

The eastern sand darter is listed as a threatened species in the State of New York. The eastern sand darter is a small freshwater fish, averaging 2.5 inches in length (NYSDEC 2009e). While, little information is available on the biology of the eastern sand darter, spawning is thought to occur beginning in May and possibly continue into the fall (NYSDEC 2009e). The spawning behavior of captive specimens has shown spawning to occur during both day and night. Eastern sand darter eggs are translucent, spherical, and slightly adhesive, and are buried singly in the substrate (NatureServe 2009).

The eastern sand darter will frequently bury itself in the sandy bottom, leaving only its eyes exposed. This behavior helps the fish to hide from predators, maintains its position in a fast-flowing stream section, and ambush prey (NatureServe 2009; NYSDEC 2009e). This species has a strong benthic association with preference within small creeks to large rivers and lake shores with slow to medium current, and lakes and lake-like expansions of rivers with fine sandy substrate, particularly sandy areas depauperate of flora and other fauna so that both competitors and predators may be lacking (NatureServe 2009). The eastern sand darter appears to be a visual feeder, preying mainly on midge larvae; it also eats other dipteran larvae, mayfly naiads, oligochaetes, and cladocerans (NatureServe 2009; NYSDEC 2009e). Feeding intensity increases between February and June and declines between September and November (NatureServe 2009).

The major cause of decline in eastern sand darter populations appears to be the loss of clean sandy substrate due to siltation. On some streams, the construction of dams led to population fragmentation. Additionally, the impoundments created with the construction of the dams act as settling basins which aggravate siltation problems. Stream pollution and channelization have also caused loss of eastern sand darter habitat (NYSDEC 2009e).

9.1.1.2 Hudson River

Shortnose Sturgeon (*Acipenser brevirostrum*)

The shortnose sturgeon is designated as a federal and New York State endangered species. The shortnose sturgeon is the smallest of New York's sturgeons, rarely exceeding 3.5 feet in length and 14 pounds in weight (Gilbert 1989; Stegemann 1994). It is restricted in range to the Atlantic seaboard in North America and occurs in estuaries and large coastal rivers. In New York State, shortnose sturgeon is found in the lower portion of the Hudson River from the southern tip of Manhattan upriver to the Federal Dam at Troy (Stegemann 1994).

The shortnose sturgeon is semi-anadromous. Spawning occurs between April and May when adult sturgeon migrate up the Hudson River from their mid-Hudson overwintering area to spawn in freshwater sites north of Coxsackie. Sexually mature males spawn every other year and females every third year (Gilbert 1989; Stegemann 1994). Eggs are deposited on the bottom and the newly hatched fry are poor swimmers and drift with the currents along the bottom. As they grow and mature, the fish move downriver into the most brackish waters of the lower Hudson River (Stegemann 1994). Shortnose sturgeon use their barbels to locate food and diets include sludge worms, aquatic insect larvae, plants, snails, shrimp, and crayfish (Stegemann 1994).

A combination of factors is responsible for the decline in shortnose sturgeon populations. During the 1800s and early 1900s, large tidal rivers, such as the Hudson River, served as dumping grounds for pollutants that resulted in major oxygen depletion. Dam construction that eliminated upstream breeding grounds and demands for sturgeon meat and caviar also contributed to the decreases in shortnose sturgeon populations (Gilbert 1989; Stegemann 1994).

A mark-and-recapture experiment performed in 1979 and 1980 was used to estimate the shortnose sturgeon population in the Hudson River. As a result of this work adult spawning population was estimated at 13,000 fish. Subsequent survey work on shortnose sturgeon indicates that the population may be significantly larger (NMFS 1998). In a mark-and-recapture study that replicated Dovel's (1979 *as cited in* NMFS 1998) methods, the estimated adult shortnose population size was 38,024. This number suggests a two to four fold increase in adult shortnose sturgeon abundance in the Hudson River over the past decade (NMFS 1998).

Atlantic Sturgeon (*Acipenser oxyrinchus*)

The Atlantic sturgeon was federally listed as endangered species on January 31, 2012 and is protected from fishing by the state of New York. The Atlantic sturgeon is an anadromous species growing up to 14 feet long and weighing more than 800 pounds. This species can live up to 60 years, with maturation in the Hudson River at 11 to 21 years of age. Spawning in the mid-Atlantic waters typically occur between April to May. Spawning adults migrate upstream and spawning takes place in flowing water between the salt front and the fall line of large rivers. Spawning interval ranges from one to five years for males and two to five years for females (NMFS 2010). Post spawning, males may remain in the river or lower estuary until the fall and females typically exit the river within four to six weeks. Forage prey consists of benthic invertebrates (i.e., mussels, worms, and shrimp). Juveniles migrate downstream and inhabit brackish waters for a few months, until approximately 30 to 36 inches in length, before moving into coastal waters (NMFS 2010). Within the Hudson River Estuary, spawning locations for Atlantic sturgeon remain poorly delineated. Juveniles typically remain within the Hudson River Estuary for two to eight years before emigrating along the Atlantic coast and its estuaries (NYSDEC 2010n).

The 2006-2008 Atlantic sturgeon tag and recapture program in the Hudson River showed that the preferred bottom habitat for this species are dynamic and depositional mud, followed by dynamic and depositional sand, and then dynamic gravel (NYSDEC 2010n). Commercial harvest from the 1950s through the mid-1990s severely decimated this population. Habitat degradation and loss continues to be a threat as this species is dependent on both estuarine and freshwater habitat, as well as bycatch mortality, impacts from dredging activities, and access impediments to available habitats by locks and dams are other threats to the Atlantic Sturgeon (NMFS 2010).

9.1.1.3 Avoidance and/or Minimization of Potential Impacts

Lake sturgeon, mooneye, and eastern sand darter are the three threatened species under New York law identified in Lake Champlain. Because lake sturgeon and mooneye utilize and prefer rocky bottom or flowing water habitat, they are not expected to occur in the vicinity of the proposed cable route which is being sited in soft bottom areas of the lake. Thus construction impacts on these two species are expected to be insignificant. In addition, the eastern sand darter has a strong demersal habitat preference in which they will frequently burrow into the sand to seek shelter and as an ambush predator. Eastern sand darters are typically found in small creeks to large rivers, but have been observed to be present along lake shores with slow moving currents or lake-like sections of larger rivers with fine sandy substrate (NatureServe 2009). Due to the stream and river preference of this species, its occurrence along the underwater cable route within Lake Champlain is expected to be low and all impacts will be insignificant.

In the Hudson River, shortnose and Atlantic sturgeon make seasonal movements up and down the River. Section 7 provides a description of the potential impacts that could be associated with construction activities, including cable installation. The juvenile and adult life stages of the TE species in the HVDC Transmission System area are highly mobile species that will generally be able to move into adjacent areas away from construction related activities. In addition, water jetting generally creates only localized increases in turbidity, often restricted to near bottom areas of the water column. Given the depth and width of the Hudson, and localized and temporary nature of any sediment suspension, no hindrance of sturgeon passage is expected during underwater cable installation. Concrete or rip-rap placement, and conventional dredging are expected to have insignificant impacts on sturgeon given either the low probability of occurrence or the very small area of the overall habitat that will be affected. Construction noise, nighttime lighting and temporary loss of benthic prey are expected to have an insignificant impact on sturgeon, because these will only occur in small, localized areas at a given time along the length of the narrow construction corridor in the river. Sturgeon will be able to utilize adjacent areas for foraging, etc.

During operation of the HVDC Transmission System, the cables will produce EMF and generate heat, which is dissipated into sediments. Further information on potential EMF and heat impacts to aquatic organisms is described in Section 7. Certain benthic feeding fish (sturgeon) have sensory mechanisms for detecting prey in the sediments. Given the small area of the river bed occupied by the cables which may be affected by the weak EMF, the potential interference with this feeding will have an insignificant impact on foraging success of sturgeon or other benthic foraging species. The heat produced by the cables will primarily be dissipated in the sediments, well below the sediment water interface which is the biologically productive zone in the sediments. Hence, there will be insignificant thermal effects on benthic prey populations of benthic feeding fish.

In order to avoid the river reach associated with the Upper Hudson River PCB Dredging Project and the sensitive habitats found in the upper portion of the Lower Hudson River, the cable route will follow an underground railroad right-of-way bypass route before entering the Hudson River at Catskill, New York (see Figure 1-1 for route mapping). Bypassing this portion of the Hudson River will avoid and/or minimize the potential for resuspending sediments with higher levels of PCBs, thereby avoiding and/or minimizing the potential for bioavailability to fish.

The Applicants have worked with the NYSDEC to establish construction windows for the length of the Hudson River to avoid periods where sensitive species are utilizing these segments of the river. These windows are based on the guidance documents prepared by the NYSDOS related to SCFWH (NYSDOS, 2011) as well as on-going studies by the State of New York.

9.2 Wildlife

9.2.1 Non-Avian Terrestrial Wildlife

This section provides a discussion of the TE species, federal candidate species and New York species of special concern potentially occurring along underground portions of the transmission cable route, including mammals, reptiles, amphibians, and invertebrates. Species described in this section include both terrestrial and semi-aquatic species that may be found using upland, wetland, and freshwater aquatic habitats along the underground portions of the transmission cable route.

9.2.1.1 Existing Conditions

The Applicants conducted a review of the potential TE species, federal candidate species and New York species of special concern with the potential to occur along the underground portions of the transmission cable route by searching the NYSDEC (NYSDEC 2009a) and USFWS (USFWS 2009) databases for species occurrences in Washington, Saratoga, Schenectady, Albany, Greene and Rockland counties. Since the Luyster Creek converter station site in New York City is within an urbanized area, the Applicants determined that no habitat for any protected non-avian terrestrial wildlife occurs at that location.

Table 9-2 provides a summary of the non-avian terrestrial TE species, federal candidate species and New York species of special concern that have the potential to occur in the Facility area, based on this preliminary review. TE species that were identified include: Indiana bat (*Myotis* *sodalis*), bog turtle (*Glyptemys muhlenbergii*) and Karner blue butterfly (*Plebejus melissa samuelis*). Other TE species and federal candidate species are described in further detail below.

Areas that have been mapped by NYNHP for occurrences of federal and state threatened, endangered, candidate, and special concern species along the Facility route were reviewed. Besides the federally listed and candidate species, there are 29 additional New York State threatened, endangered or special concern species that have been recorded in the counties crossed by the underground portions of the Facility. Several of these species have been assessed as unlikely to occur in the Facility area (Table 9-2), based on a lack of habitat along the transmission cable route near known occurrence records or a lack of confirmed records in the last century. The Facility crosses one NYNHP-mapped area for frosted elfin (*Callophrys irus*), a state-listed threatened species, which is discussed in further detail below. The remaining species listed in Table 9-2 may occur or have habitat along the proposed transmission cable construction zone, based on a preliminary survey.

Indiana Bat (*Myotis sodalis*)

Indiana bat is a federal and New York State endangered species that may be resident within the Hudson River Valley throughout the year. In the winter, Indiana bats hibernate in large colonies in caves and mines, which are called hibernacula. Hibernation can begin as early as September and can extend to late May (NYSDEC 2010o). In the spring, the bats emerge and travel to wooded or semi-wooded habitats for the summer (USFWS 2004). These summer habitats may be many miles from the winter hibernacula (NYNHP 2009a). The bats mate in the fall prior to hibernation; after the spring emergence, females group to form small maternity colonies, where they give birth to young. These colonies are located in the crevices or under loose bark in large dead or living trees. Roost trees may be in upland areas or floodplain forests (USFWS 2004). Occasionally man-made structures, such as sheds or bridges may be used as roosts (USFWS 2004).

The historic and potential range for Indiana bat includes the entire Facility overland route along the Hudson River Valley (NYSDEC 2010o). Hibernacula for Indiana bats have been known to occur in Albany County until recently, but USFWS now considers Indiana bats to be extirpated from the area, or present only in very low numbers (USFWS 2010). The USFWS has therefore determined that it is “unlikely that they would be present and impacted by any specific proposed projects in Albany, Rensselaer, Saratoga, Schenectady and Schoharie Counties” (USFWS 2010). Summer habitat for Indiana bats, however, has the potential to occur along underground portions of the Facility route in Washington County, due to the presence of known hibernacula in nearby Warren and Essex counties (NYNHP 2009a).

No caves or mines that could be used as hibernacula have been identified along the transmission cable route. Indiana bat roosts and maternity colonies may be associated with a variety of forested communities types identified along the underground transmission cable construction zone, including Appalachian oak-hickory, beech-maple mesic, floodplain, and hemlock-northern hardwood forests (NYNHP 2009a). Although much of the habitat within the immediate vicinity of the underground bypass routes consists of disturbed open lands and secondary forest, lacking suitable trees for bat roosts, a few areas do have large shagbark hickories (*Carya ovata*) and/or other large trees that could support summer bat colonies.

Bog Turtle (*Glyptemys muhlenbergii*)

Bog turtles are small, semi-aquatic turtles that are listed as threatened in the United States and endangered in New York State. Primary habitats for bog turtles include open wet meadows and calcareous bogs, which can be isolated or part of a larger wetland complex (NYNHP 2009b). Frequently, these habitats are dominated by sedges (*Carex* spp.) and mosses (*Sphagnum* spp.) (NYSDEC 2010p). Adult bog turtles hibernate in a burrow or muskrat lodge from September to mid-April (NYSDEC 2010p). In the early summer, females lay eggs in a tussock. Once hatched, the young will typically spend the winter within the nest (NYSDEC 2010p).

Bog turtles historically occurred throughout the Hudson River Valley. However, known extant populations are limited to the southern counties along the Hudson River. Therefore, although suitable bog turtle habitat associated with open-canopy red-maple hardwood swamps, sedge meadows and/or fens may be present along the proposed transmission cable construction zone in Washington, Saratoga, Schenectady, and/or Albany counties, no recent records suggest that bog turtles are likely to occur.

Karner Blue Butterfly (*Plebejus melissa samuelis*)

Karner blue butterfly is a federal and New York State endangered species occurring in scattered populations in New Hampshire, New York, and the upper Midwest. In New York, Karner blues are found in the Hudson Valley sand belt extending from near Albany to Glens Falls (NYSDEC 2010q). The species is highly specialized on the larval host plant, wild blue lupine (*Lupinus perrenis*). Two generations occur per year. One generation hatches from overwintering eggs and emerges from May to June. These adults lay eggs to produce the second generation, which emerges from mid-July to mid-August (NYSDEC 2010q). Natural habitat for Karner blue butterflies includes pine barrens, oak savannahs, and openings in oak woodlands (NYNHP 2009c). Within their restricted range, Karner blue butterflies now also occur in man-made openings along rights-of-way, at airports and in sandy old fields (NYNHP 2009c) wherever wild blue lupine is present.

Potential habitat for Karner blue butterfly does occur along the underground cable route in Saratoga, Schenectady, and Albany counties. In the spring of 2010, the Applicants completed a desktop review and subsequent field survey of the Facility route in these counties to identify areas with potential habitat for Karner blue butterfly. Lupine and nectar surveys were conducted from June 6 through June 14, 2010, which is within the blooming period for wild blue lupine (*Lupinus perennis*), in accordance with the survey protocol described in “Karner Blue Butterfly (*Lycaeides melissa samuelis*) Survey Protocols Within the State of New York” (USFWS 2008). Lupine and nectar patches were identified and mapped along the Canadian Pacific (CP) portion of the route. No lupine patches were found within surveyed areas along the CSX Railroad (CSX) portion of the route in Schenectady County and, as the species’ lifecycle depends on the lupine flower, it was determined that this area is unlikely to support nectaring adult Karner blue butterflies.

Frosted Elfin (*Callophrys irus*)

Frosted elfin is a state-listed threatened species of butterfly that occurs in the upper Hudson River Valley, Long Island, and parts of western New York. In the upper Hudson River area, it feeds on wild blue lupine associated with pine barrens, oak savannahs, dry oak forests, and disturbed grasslands within rights-of-way and airports (NYNHP 2009e). Habitat requirements are similar to the Karner blue butterfly and the results of the field study described for this species are applicable to the Frosted elfin.

9.2.1.2 Avoidance and/or Minimization of Potential Impacts

Where underground routing is proposed, the Applicants have avoided and/or minimized impacts by siting the underground transmission cables along previously disturbed railroad and roadway rights-of-way, to the extent possible. To further avoid and/or minimize potential impacts to wildlife including TE species, the Applicants have proposed to use the HDD method at all landfall locations. Where the HDD method is used, surface impacts to habitats between the drill entry and exit points will be avoided and/or minimized.

Use of a previously disturbed rights-of-way for the underground transmission cables will generally reduce potential impacts for terrestrial TE species, federal candidate species, and New York species of special concern. The Applicants have initiated discussions with the NYNHP, NYSDEC, and USFWS for information and recommendations regarding TE species, federal candidate species and New York species of special concern along the underground transmission cable route. Based on the results of these coordination efforts, the Applicants may conduct species-specific surveys or implement additional methods to avoid and/or minimize any potential impacts to listed species, as necessary.

Based on a low likelihood of occurrence, the Applicants do not anticipate any impacts to bog turtle along the underground cable construction zone. Summer habitat for Indiana bat could occur along the cable construction zone in Washington County, due to presence of existing winter hibernacula in adjacent counties. Potential impacts to Indiana bat could occur if occupied roost trees within the construction zone are cleared, or if construction activities result in the disturbance of the roost trees immediately adjacent to the construction zone. Although a few large trees have been noted along the underground cable bypass route, the cables are generally located along existing, disturbed rights-of-way. In general, there is a limited number of potentially suitable summer roost trees within and adjacent to the construction zone. The Applicants will continue to coordinate with USFWS for recommendations regarding avoidance and/or minimization of any potential impacts to Indiana bat. If vegetation removal and tree clearing for the Facility is conducted in the summer months, outside of the Indiana bat hibernation period (October 1 through March 31), the Applicants will coordinate with USFWS prior to clearing any large trees that could support Indiana bats.

Habitat for Karner blue butterfly and frosted elfin is known to occur in the vicinity of the underground transmission cable construction zone. These species use similar open habitats with patches of wild blue lupine, the larval host plant. The Applicants have prepared a document entitled "Karner Blue Butterfly (*Lycaeides melissa samuelis*) Impact Avoidance and

Minimization Report" (TRC 2011). This report outlines the proposed construction techniques for the on-land portion of the route including those areas in the vicinity of the Karner blue butterfly occupied habitat, presents cable route mapping for the portion of the route in the vicinity of the butterfly's occupied habitat, and describes the proposed restoration techniques and Operation and Maintenance (O&M) protocols. Based on the analysis and avoidance and/or minimization measures included in this report, the Applicants anticipate that any impacts to the Karner blue butterfly and frosted elfin will be insignificant.

Temporary impacts to other TE species with the potential to occur in the Facility area from construction noise, and vegetation clearing within the construction zone will be avoided and/or minimized. Mobile wildlife species such as mammals and snakes are expected to move into similar adjacent habitats nearby during construction and return to the area once construction is completed. The Applicants have initiated discussions with NYNHP, NYSDEC, and USFWS for additional information and recommendations for the avoidance and/or minimization of potential impacts on wildlife species during construction and operation of the Facility.

Potential habitats for terrestrial TE species and New York species of special concern within the construction zone and any additional workspaces will be temporarily impacted by vegetation clearing, ground disturbance and construction activity. However, the Applicants will implement Best Management Practices to avoid and/or minimize impacts to occupied habitats of TE species that occur along or adjacent to the Facility route. Upon completion of construction, the Applicants will conduct initial restoration activities, such as soil stabilization and temporary seeding of disturbed areas. Once vegetation cover has been re-established, any areas that are impacted during the cable installation will be allowed to re-vegetate naturally. Initially, the construction zone may provide some new habitat for species of special concern that may use disturbed, open areas and clearings, such as Eastern box turtle and tawny crescent. Some temporary loss of woodlands may occur due to tree clearing along the edge of the construction zone in forested areas. Forested areas within the construction zone are expected to go through a series of successional stages before the redevelopment of a mature canopy. To avoid and/or minimize impacts to forested communities, the Applicants will avoid and/or minimize the cutting of mature trees. Unless required for safety, the Applicants will limit the removal of stumps and roots that are not in the footprint of the excavated trench, to facilitate the recovery of woody species. The Applicants will develop a Vegetation Management Plan as part of the EM&CP.

Because the cable will be buried, no permanent aboveground impacts to habitat of listed species will result. Only limited but periodic vegetation management will be conducted by the Applicants along the Facility Permanent Right-of-Way during repairs or other maintenance work and for selective cutting to prevent the establishment of large trees directly over the cables. See Section 4 for additional information on vegetation impacts and mitigation. Since the Luyster Creek converter station is located in an urban environment impacts on TE species are anticipated to be insignificant.

9.2.2 Avifauna

This section provides information regarding TE species, federal candidate species and New York species of special concern for bird species that may be present in the vicinity of the proposed transmission cable route in New York State. Listed bird species may be present in a variety of habitats, including terrestrial, freshwater aquatic, coastal, estuarine, and marine habitats along the Facility route.

9.2.2.1 Existing Conditions

The Applicants conducted a preliminary review of the potential TE species, federal candidate species and New York species of special concern for bird species with the potential to occur along the underground and underwater transmission cable construction zones, by searching the NYSDEC (NYSDEC 2009a) and USFWS (USFWS 2009) databases for occurrence records in counties crossed by the Facility. Table 9-3 provides a summary of the avian species that have the potential to occur in the Facility area, based on this preliminary review. Species that use only terrestrial habitats have been included only if records indicate possible occurrences in counties crossed by the underground portions of the Facility route (Washington, Saratoga, Schenectady, Albany, Greene and Rockland counties). Since the Luyster Creek converter station in New York City is within an urbanized area of New York City, the Applicants determined that no terrestrial habitat for any protected bird species is likely to occur at that location; however, species that may occur in nearby coastal habitats were assessed.

Two avian TE species, roseate tern (*Sterna dougallii*) and piping plover (*Charadrius melodus*), have the potential to occur in coastal areas along certain portions of the underwater transmission cable construction zone. Additionally, although bald eagles (*Haliaeetus leucocephalus*) are no longer listed under the ESA, they are still afforded federal protection under the Bald and Golden Eagle Protection Act (BGEPA) and are listed as threatened in New York. Avian TE species and federal candidate species are described in further detail below.

Areas that have been mapped by NYNHP for occurrences of TE species, federal candidate species, and New York species of special concern species along the Facility route were reviewed. Besides the federal threatened, endangered and candidate species, an additional 32 New York State threatened, endangered and special concern avian species may occur in counties crossed by the underground and/or underwater portions of the transmission construction zone. Several of these species are unlikely to occur in the Facility area (Table 9-3), due to lack of habitat along the transmission cable route within the species' distribution. The remaining species may occur or potentially have habitat along the proposed transmission cable route, based on preliminary assessment. Henslow's Sparrow (*Ammodramus henslowii*), a state-listed threatened species with a NYNHP-mapped occurrence area along the transmission cable construction zone, is discussed in further detail below.

<u>Roseate Tern (*Sterna dougallii*)</u>

Roseate terns are federally listed as endangered in the northeastern United States, and are also listed as endangered in New York State. Roseate terns in the northeastern United States breed in only a few scattered colonies on sandy beaches along the Atlantic coast, and winter primarily in northern South America (NatureServe 2009). The primary breeding colony in New York is Great Gull Island in Long Island Sound (NYSDEC 2010r). Birds arrive at the breeding grounds in late April or early May and remain until late July, when they begin staging for migration to the wintering grounds in late summer (Spendelow 1995). Roseate terns feed offshore on small schooling fish such as sand lance.

Recent occurrences of roseate terns have been documented in Queens and Nassau counties. The Applicants do not anticipate any impacts to sand beach habitat from construction of the Facility and no breeding colonies for roseate tern have been identified in the immediate vicinity of the underwater transmission cable route.

Piping Plover (*Charadrius melodus*)

Piping plovers are small shorebirds that forage invertebrates on beaches, sand dunes, and on tidal wrack (NYSDEC 2010s). Atlantic coast populations of piping plover are federally listed as threatened; inland populations in other parts of the United States are federally endangered. Piping plovers are also listed as endangered by New York State. Plovers on the Atlantic coast breed on sandy beaches from North Carolina to Canada, arriving on the breeding grounds in March and departing by early September (NYSDEC 2010s). They winter primarily in coastal areas from North Carolina to Texas (NYSDEC 2010s). In New York, breeding is mostly along on coastal beaches of Long Island.

No suitable habitat for breeding piping plovers occurs along the underwater transmission cable route. The tidal area at the landfall for cables connecting to the Luyster Creek converter station is also unlikely to support foraging piping plovers. Although some mud and wrack may be exposed during low tide below the rip-rap slope at this location, which could be used by feeding shorebirds, the habitat is marginal and within a largely urban landscape; therefore, it is unlikely that this particular area will be used for foraging. The Applicants have also proposed to use the HDD method for landfalls at the converter station site, avoiding and/or minimizing impacts to coastal habitats.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are protected under the federal Bald and Golden Eagle Protection Act, and are listed as threatened in New York State. Bald eagles are a large piscivorous raptor, mostly occurring in undisturbed areas near large lakes, reservoirs, or major rivers (NYNHP 2009f). Nests require large, tall trees, usually near water, and they are often used for multiple years. In New York, bald eagles are present throughout the state, except on Long Island, and they occur during both breeding and non-breeding seasons. Breeding birds may be present in the Lake Champlain area and near other large rivers, lakes, and impoundments along both the underwater and underground portions of the transmission cable construction zone. The Hudson River Valley provides important wintering habitat for concentrations of eagles in New York State, particularly along the lower Hudson River (NYNHP 2009f).

Henslow's Sparrow (*Ammodramus henslowii*)

Henslow's sparrow is a state-listed threatened species of passerine that breeds in tall, dense grasslands, fields, and wet meadows without woody vegetation. In New York State, it occurs in the Hudson River Valley and central and western parts of the state. The decline of the species is largely attributable to the regeneration of forests and the decrease in grasslands and hayfields (NYNHP 2009g). Although records from recent decades exist, the latest Breeding Bird Atlas (2000-2005) failed to confirm Henslow's sparrow breeding in either Saratoga or Schenectady County (NYNHP 2009g). The transmission cable construction zone crosses an area mapped by the NYNHP for occurrences of Henslow's sparrow (prior to 1977) in Albany County.

9.2.2.2 Avoidance and/or Minimization of Potential Impacts

Temporary impacts to avian TE species and their occupied habitats from construction and operation of the Facility will be avoided and/or minimized. The installation of the transmission cables below ground avoids and/or minimizes bird mortality from collision and electrocution that has been frequently associated with overhead transmission wires and tower structures. The Applicants have further avoided and/or minimized impacts to potential bird nesting areas in terrestrial habitats by installing the cable underwater, where feasible. Where underground bypass routes are required, the Applicants have avoided and/or minimized habitat impacts by siting the Facility construction zone parallel to existing disturbed railroad and roadway rights-of-way to the extent possible. To further avoid and/or minimize habitat impacts, the Applicants have proposed to use the HDD method at all landfall locations. Where the HDD method is used, surface impacts to occupied habitats between the drill entry and exit points will be avoided and/or minimized.

Along the underground portions of the transmission cable route, impacts on avian TE species and their occupied habitats from noise and vegetation clearing will be avoided and/or minimized. Most birds along the underground routes are expected to move into similar adjacent habitats nearby during construction and return to the area once construction is completed. If vegetation clearing of the underground transmission cable construction zone is conducted during the nesting season direct impacts to bird nests within the construction zone could occur. Disturbance may also result in parental abandonment of eggs or young in nests built in habitats immediately adjacent to the construction area. If construction is scheduled during the breeding season, the Applicants will continue to work with NYNHP, NYSDEC, and USFWS, to determine if any additional impact avoidance and/or minimization measures are appropriate for avian TE species that may nest along the underground portions of the Facility route.

The transmission cable construction zone crosses an area mapped by the NYSDEC for Henslow's sparrow; however, the associated records are prior to 1977, which may suggest that the species no longer is present in the area. If Henslow's sparrow does occur within or adjacent to the underground cable route, construction and operation of the Facility is not expected to result in any impact to the occupied habitat for the species. Grassland habitats, like those required by Henslow's sparrows, will be expected to return quickly within the construction zone following initial restoration. Impacts to Henslow's sparrow, as with other passerine species, could occur if vegetation clearing activities occur during the breeding season. The Applicants will continue to work with USFWS, NYNHP, and NYSDEC regarding the possible presence of Henslow's sparrow within the Facility area.

The Applicants have tried to avoid and/or minimize the permanent alteration of terrestrial habitats that may be associated with avian TE species along the transmission cable construction zone. Following the construction and restoration of the right-of-way, impacted areas will be allowed to revegetate naturally. This may initially create some new habitat for species that use early successional habitats, such as vesper sparrow and yellow-breasted chat. Some temporary loss of woodlands may occur, due to tree clearing along the edge of the construction zone in forested areas. Forested areas within the construction zone are expected to go through a series of successional stages before the redevelopment of a mature canopy. To avoid and/or minimize impacts to forested communities, the Applicants will avoid and/or minimize the cutting of mature trees. Unless required for safety, the Applicants will limit the removal of stumps and roots that are not in the footprint of the excavated trench, to facilitate the recovery of woody species.

During operation of the Facility, only limited vegetation management will be conducted by the Applicants along the underground transmission cable construction zone, primarily to ensure that large woody vegetation does not grow over the cable(s), or in the event that repairs or other maintenance of the cables is required. The Applicants will develop a Vegetation Management Plan as part of the EM&CP. Any periodic vegetation management that is currently conducted by the railroads will continue. This means that over time, natural revegetation within the disturbance area will generally result in a habitat that resembles the pre-construction habitat.

Coastal species, including bald eagle and roseate tern, could encounter temporary, increased noise from underwater cable installation methods, HDDs and/or increased construction vessel traffic. Although roseate terns may be present within Long Island Sound, impacts from construction activities are expected to have an insignificant effect on foraging terns. Abundant foraging habitats are available within the terns' normal range, such that construction activity is not expected to impact its normal foraging activities.

The transmission cable route does not cross any sand beaches and no tern colonies or piping plover breeding areas adjacent to the Facility route have been identified. However, the Applicants will continue to work with USFWS, NYNHP, and NYSDEC regarding any potential impacts and avoidance and/or minimization measures to these TE species or nearby tern colonies.

Impacts to bald eagles could occur if either aboveground or underwater construction results in disturbance to nesting, foraging or wintering birds from noise, construction activity, and/or vehicle traffic. According to NYNHP, a 500-meter buffer zone may be appropriate to avoid disturbances to nesting eagles (NYNHP 2009f). Construction activity may also affect concentrations of wintering eagles on the lower Hudson. The Applicants will work with NYNHP and USFWS for recommendations to avoid and/or minimize disturbance to breeding and wintering eagles along the Facility construction zone and to determine if any known bald eagle nests occur in the vicinity of the Facility.

9.2.3 Plants

This section provides a discussion of the RTE plants and federal candidate species potentially occurring along underground portions of the Facility route. Species described in this section include both terrestrial and semi-aquatic species that may be found using upland, wetland, and freshwater aquatic habitats along the primarily terrestrial portions of the Facility routes. A discussion of significant natural communities and protected communities is provided in Section 4, Vegetation.

9.2.3.1 Existing Conditions

The Applicants conducted a preliminary review of the RTE plants and federal candidate species with the potential to occur along the underground portions of the transmission cable construction zone, by searching the NYSDEC (NYSDEC 2009a) and USFWS (USFWS 2009) databases for species occurrences in Washington, Saratoga, Schenectady, Albany, Greene, and Rockland counties. One RTE plant, small whorled pogonia (*Isotria medeoloides*), has been historically recorded in Washington County. Other state-listed species with NYNHP-mapped occurrence areas along the underground transmission cable route have been included in Table 9-4, along with their known habitat associations.

Small whorled pogonia is a federally listed threatened and New York State endangered orchid, inhabiting semi-open second-growth deciduous forests or older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory. Occasionally it occurs in pine or hemlock woods. Typically it prefers acidic and mesic soils, often on slopes near small streams (NatureServe 2009, USFWS 2008). The last documentation of the species in Washington County was in 1875 (NYSDEC 2009a), and the USFWS considers the species to be extirpated from New York (USFWS 2008); therefore, the Applicants consider this species as unlikely to occur within the Facility area.

Because many plant populations are not well documented, it is possible that additional plant species occurrences may be identified during field studies. The Applicants have initiated discussions with the NYNHP, NYSDEC, and USFWS, for further information and recommendations regarding RTE plants. It is expected that coordination with these agencies will allow the Applicants to further refine the list of species with potential presence in the Facility area. The evaluation of Facility impacts on state listed plant species will be expanded, if necessary, following agency responses to consultation requests. Until then, only the small whorled pogonia is discussed in this section.

9.2.3.2 Avoidance and/or Minimization of Potential Impacts

The Applicants will coordinate with NYNHP, NYSDEC, and USFWS to avoid and/or minimize impacts to RTE plants. Potential impacts to RTE plants from vegetation clearing and ground disturbance in the construction zone or additional workspaces will be avoided and/or minimized by coordinating with NYNHP, NYSDEC, and/or USFWS, including the need for any species-specific surveys are needed for listed plant species along the Facility route. If populations of RTE plants are observed to be present in the Facility Area, the Applicants will consult with NYSDEC and USFWS to determine measures to avoid and/or minimize impacts, which may include, but will not be limited to, measures such as: delineation and avoidance of plant populations, scheduling construction outside of the growing season for annual plants, or relocation of individual plants to suitable habitat outside of the construction zone.

Small whorled pogonia has historically occurred in Washington County and suitable secondary growth forests may occur along the transmission cable construction zone. It is possible, however, that the species is extirpated from the state (USFWS 2008). The Applicants will work with USFWS regarding the need for any species-specific surveys for small whorled pogonia along the underground transmission cable route.

9.2.4 Marine Mammals and Sea Turtles

9.2.4.1 Marine Mammals

Table 9-5 lists the TE species of marine mammals known to occur in the coastal waters of Long Island, Staten Island, and the greater New York City area. These TE species are transients, visiting nearshore marine waters as nursery ground and feeding habitat before migrating to other locations. Additionally, one federally protected and New York State species of special concern, the harbor porpoise (*Phocoena phocoena*), has the potential to occur within the vicinity of the HVDC Transmission System.

Fin Whale (*Balaenoptera physalus*)

In the western North Atlantic, fin whales are a federal and New York State endangered species. Fin whales are common in summer from Cape Hatteras north; distributed from the coasts of Canada, Newfoundland, and Cape Cod in the north to the Gulf of Mexico and the shores of Florida and the Greater Antilles in the south. In summer fin whales are concentrated between shore and the 1800 m curve from 41°N to 57°N. They tend to be nomadic and migrate to subtropical waters for mating and calving during the winter and to high latitudes and cold currents for feeding in the summer, with the New England waters represent a major feeding ground for this species (Waring et al. 2009).

The best abundance estimate available for the western North Atlantic fin whale stock is 2,269 individuals. This August 2006 estimate is recent and provides an estimate when the largest portion of the population was within the study area (Waring et al. 2009). The worldwide population estimate for this species is approximately 11,000 individuals (NOAA 2009c).

Fin whales can be found in social groups of two to seven whales and in the North Atlantic, or occasionally in groups of up to 100 on feeding grounds during migration (NOAA 2009c). New England waters represent a major feeding ground for this species (Waring et al. 2009). This species are often seen feeding in large groups that include humpback and minke whales and Atlantic white-sided dolphins (NOAA 2009c). Primary prey include krill, small schooling fish (e.g., herring, capeline, and sand lance), and squid (NOAA 2009c; OBIS 2009d).

Little is known about the social and mating systems of fin whales. Males become sexually mature at 6 to 10 years of age and females at 7 to 12 years of age. Breeding may occur throughout the year, although the peak period occurs from November or December until about March. The gestation period lasts about 12 months and the calf weighs about two tons at birth, with birth given in tropical and subtropical areas during mid-winter (NOAA 2009c).

Humpback Whale (*Megaptera novaeangliae*)

In the Western North Atlantic, humpback whales are a federal and New York State endangered species. Humpback whales feed during spring, summer, and fall over a geographic range encompassing the eastern coast of the United States, the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Waring et al. 2009).

The overall North Atlantic population (including the Gulf of Maine), derived from genetic tagging data collected on the breeding grounds, was estimated to be 7,698 individuals, including 4,894 males and 2,804 females (Waring et al. 2009). The worldwide population estimate for this species is approximately 56,600 individuals with the Gulf of Maine stock appears to be on an increase (NOAA 2009d).

Humpback whales pass through New England waters in April and May during their northward migration and on their southward migration, they pass through New England waters from October through December (Waring et al. 2009). During winter, whales from most Atlantic feeding areas (including the Gulf of Maine) mate and calve in the West Indies, where spatial and genetic mixing among subpopulations occurs (Waring et al. 2009). In New England waters, feeding is the principal activity of humpback whales, and their distribution in this region has been largely correlated to prey species and abundance (Waring et al. 2009).

Humpback whales are seen singly, in pairs, or in small groups of 12 or more. They reach sexual maturity at about nine years of age, when males reach approximately 33 feet long and females reach approximately 36 feet long. Breeding occur throughout the year, with the gestation period lasting 11 to 12 months. In the Atlantic, the shallow waters of the Caribbean Sea provide wintering and breeding areas. Calving occurs at two-year intervals, but some females give birth every year (NOAA 2009d; OBIS 2009e).

Humpback whales are generalists, eating krill, copepods, fish, and cephalopods. When in New England waters, this species typically become piscivorous feeding on herring, sand lance, and other small fishes. Humpback whales rarely feed in winter, foraging during summer in areas of prey concentration such as upwelling regions (NOAA 2009d; OBIS 2009e).

Sei Whale (*Balaenoptera borealis*)

Sei whales are a federal and New York State listed endangered species. Sei whales can be found in the Atlantic, Indian, and Pacific oceans. During the summer, they are commonly found in the Gulf of Maine and on Georges and Stellwagen banks in the Western North Atlantic (NOAA 2009e; Waring et al. 2009). Sei whales do undergo seasonal migrations, although not as extensive as those of some other large whales and may exhibit seasonal migration toward the lower latitudes during the winter and higher latitudes during the summer (NOAA 2009e; OBIS 2009f).

Sei whales are usually seen as singles or pairs, but sometimes thousands may gather if food is abundant. They are fast swimmers up to 35 miles per hour (OBIS 2009f). Sei whales are shallow divers and only remain submerged for 5 to 20 minutes (NOAA 2009e). This species typically feed on plankton (e.g., copepods and krill), small schooling fish, and cephalopods (e.g., squid) by both gulping and skimming (NOAA 2009e). They prefer to feed at dawn and may exhibit unpredictable behavior while foraging and feeding prey (NOAA 2009e).

Breeding occurs between November and March, with the peak in January. The gestation period lasts 10.5 to 12 months. Calves are dependent on milk from the mother for about nine months and are weaned when they reach 24 to 27 feet in length. Both sexes become sexually mature at about 8 to 10 years of age and breeding occurs at intervals of three years (NOAA 2009e; OBIS 2009f).

Harbor Porpoise (*Phocoena phocoena*)

Harbor porpoise occur in relatively discrete regional populations throughout northern temperate and subarctic coastal and offshore waters of the Northern Hemisphere. They are commonly found in bays, estuaries, harbors, and fjords less than 200 meters (650 feet) deep (NOAA 2009f). In the north Atlantic, they range from west Greenland to Cape Hatteras, North Carolina (NOAA 2009f). For the Gulf of Maine/Bay of Fundy stock, harbor porpoises are concentrated in the northern Gulf of Maine and southern Bay of Fundy region during summer months (July to September) and are generally found in waters less than 150 meters deep (Waring et al. 2009). During the fall (October to December) and spring (April to June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south, and can be seen from the coastline to deep waters (greater than 1,800 meters) with majority of the population found over the continental shelf (Waring et al. 2009). Stranding reports from 2006 to 2007 for the coastal waters of Long Island, Staten Island, and the New York City area showed a total of three harbor porpoise standings occurred, none of which occurred in the vicinity of the HVDC Transmission System (RFMRP 2008).

Estimates of the population size of harbor porpoises in the Gulf of Maine and Bay of Fundy region were conducted during the summers of 1991, 1992, 1995, 1999, 2002, 2004, and 2006. The best current abundance estimate for the Gulf of Maine and Bay of Fundy region harbor porpoise was based on the 2006 survey results, with the stock population at approximately 89,054 individuals (Waring et al. 2009).

Most harbor porpoise groups are small, generally consisting of no more than five or six individuals. However, during feeding or migration, they can aggregate into large, loose groups of 50 to several hundred animals. Harbor porpoises sometimes lie at the surface for brief periods between submergences and the reason for this behavior is unknown (OBIS 2009a). This species reaches sexual maturity at 3-4 years of age, with geographic and density-dependent variation. Gestation lasts approximately 10.6 months with most calves being born from spring through mid-summer (OBIS 2009a). The main prey items for the harbor porpoise appear to vary regionally. In general, this species eats a wide variety of fish and cephalopods and small, non-spiny schooling fish (i.e., herring and mackerel) are most common prey in many areas. They also feed on a wide variety of benthic and/or demersal species (OBIS 2009a). The main threats to the harbor porpoise include: fisheries bycatch, entanglement in fishing gear, harvest, and organochlorine contamination (OBIS 2009a).

9.2.4.2 Sea Turtles

Table 9-6 lists the TE species of sea turtles known to occur in the coastal waters of Long Island, Staten Island, and the greater New York City area. The Riverhead Foundation for Marine Research and Preservation ("RFMRP") has operated the marine mammals and sea turtles rescue program since 1996. Their program provides a record of the occurrences of various species that occur in Long Island Sound and surrounding waters (Figure 9-1). These TE species of sea turtle are transients, visiting the nearshore coastal waters of the region as nursery ground and foraging habitat before migrating to other locations.

Leatherback Sea Turtle (*Dermochelys coriacea*)

Leatherback sea turtles are a federal and New York State listed endangered species. Leatherback sea turtles are commonly known as pelagic animals, but also forage in coastal waters (NOAA 2009g). Leatherback turtles occupy large, open bays in the northeastern United States from June to November; the southern migration to Maryland and Virginia occurs in nearshore waters from August to November (NMFS 2001). Although considered an oceanic species, leatherback turtles are sometimes found in waters as shallow as 60 meters (NMFS 1993).

Females reach sexual maturity at about 4 feet of carapace length (about 10 years old) and size at maturity for males is unknown. Female leatherback sea turtles may nest at 2 to 3 year intervals. Nesting locations in the Atlantic are scattered throughout the Gulf of Mexico, Caribbean, and southeast United States, with the largest assemblages found in the United States Virgin Islands, Puerto Rico, and Florida. A small number of leatherback sea turtles were reported to nest in Texas and Georgia (NOAA 2009g).

The preferred food of the leatherback sea turtle include jellyfish, comb jellies, salps, and other related animals, with jellyfish as their primary food source (USACE 1994). However, organisms such as larval fishes and decapod crustaceans have also been known to be ingested by the leatherback sea turtles (Pritchard et al. 1983). This species follow the migration of jellyfish along the Gulf Stream, at water depths greater than 200 feet, into the Gulf of Maine in late summer, and then return to southern waters by winter. In some years, they are locally common south of Long Island, New York and in central and eastern portions of the Gulf of Maine. Winter area for the leatherback sea turtle is the Gulf of Mexico and along the Florida coast (NOAA 2009g).

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

The Kemp's ridley sea turtles are a federal and New York State listed endangered species. Kemp's ridley sea turtles are found primarily in the Gulf of Mexico, but occur along the Atlantic coast of the United States and Canada as well from Florida to New England (NOAA 2010i; OBIS 2010i). Adult Kemp's ridley sea turtles primarily occupy neritic zones that typically contain muddy or sandy bottoms where prey can be found. Juveniles of many species of sea turtles have been known to associate with floating sargassum seaweed, utilizing the sargassum as an area of refuge, rest, and/or food (NOAA 2010i).

The primary range of adult Kemp's ridley sea turtle is the Gulf of Mexico, although an unknown portion of the population, made up of juveniles, can be found at inshore bays and estuarine habitats from Cape Hatteras to Cape Cod Bay from July to November (NMFS 2001). The Kemp's ridley sea turtle migrates along the Atlantic coast to New England as the Gulf Stream warms to approximately 15°C, arriving in the New York Harbor in late June or July (Morreale and Standora 1990). As the water warms, Kemp's ridley sea turtles continue to move up the coast or into Long Island Sound and forage throughout the fall (USACE 1994).

Kemp's ridley sea turtles nest in large aggregations between April and June in Rancho Nuevo, on the northeastern coast of Mexico in southern Tamaulipas. Mating has been observed just offshore of the nesting beaches. Females typically nest every two years, laying an average of 2.5 clutches each containing approximately 100 eggs. Age at maturity is estimated to be 7 to 15 years (OBIS 2010i). Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks (NOAA 2010i).

Loggerhead Sea Turtle (*Caretta caretta*)

Loggerhead sea turtles are a federal and New York State listed threatened species. In the Atlantic, loggerhead sea turtles range extends from Newfoundland to as far south as Argentina. During the summer, nesting occurs primarily in the subtropics. Although the major nesting concentrations in the United States are found from North Carolina through southwest Florida, minimal nesting occurs outside of this range westward to Texas and northward to southern Virginia (NOAA 2010j; OBIS 2010j). Adult loggerheads are known to make extensive migrations between foraging areas and nesting beaches. During non-nesting years, adult females from United States beaches are distributed in waters off the eastern United States and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán (NOAA 2010j).

Loggerhead sea turtles are found along the continental shelf and in large bays from July to November as far north as Cape Cod Bay (NMFS 2001). Loggerheads can be found in a variety of habitats such as coral reefs, rocky bottoms, shellfish beds, and boat wrecks, and are common in waters less than 50 meters (Shoop and Kenney 1992). Juvenile and subadult loggerheads are known to migrate into Long Island Sound in June and remain until November (Morreale and Standora 1990).

Loggerhead sea turtles reach sexual maturity at around 30 to 40 years of age (NOAA 2010j; OBIS 2010j). In the southeastern United States, mating occurs in late March to early June and females lay eggs between late April and early September. Females lay three to five nests, and sometimes more, during a single nesting season. The eggs incubate approximately two months before hatching sometime between late June and mid-November (NOAA 2010j; OBIS 2010j).

Loggerhead sea turtles eat a wide variety of prey items, including invertebrates. This species feed primarily on shellfish and crabs on the seafloor, but also scavenge fish or fish parts as available (e.g., from fisheries discards). Pelagic stage loggerheads feed on the assemblage of species found with sargassum rafts, especially coelenterates and gastropods (OBIS 2010j). Diets of loggerheads in the Long Island Sound and Raritan Bay consist primarily of spider, rock, and horseshoe crabs (Burke et al. 1990).

Green Sea Turtle (*Chelonia mydas*)

Green sea turtles are a federal and New York State listed threatened species. In United States Atlantic and Gulf of Mexico waters, green sea turtles are found in inshore and nearshore waters from Texas to Massachusetts, the United States Virgin Islands, and Puerto Rico. Green sea turtles have occasionally been seen in nearshore waters from Massachusetts to Virginia from July to November (NMFS 2001) and like the loggerhead and Kemp's ridley, green sea turtles move southward in late fall as water temperatures decline in Long Island Sound (USACE 1994).

This species use three types of habitat: oceanic beaches (for nesting), convergence zones in the open ocean, and benthic feeding grounds in coastal areas. After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years (NOAA 2010k; OBIS 2010k). The green sea turtle is an herbivore that feeds on seagrasses or algae (Burke et al. 1992). Green sea turtles in the western Atlantic, including Long Island Sound, feed primarily in areas of extensive seagrasses (USACE 1994). However, studies have shown that green sea turtles are opportunistic feeders that utilize available animal food sources supplied by man, thus indicate feeding of jellyfish or sponges may occur on rare occasions (Hildebrand 1982).

Sexual maturity is estimated anywhere between 20 and 50 years, at which time females begin returning to their natal beaches every 2 to 4 years to lay eggs (NOAA 2010k). The nesting season varies depending on location. In the southeastern United States, females generally nest between June and September, while peak nesting occurs in June and July. Eggs are laid in clutches, approximately 100 to 115 eggs per clutch and incubation lasts approximately two months before hatching (NOAA 2010k; OBIS 2010k).

9.2.4.3 Avoidance and/or Minimization of Potential Impacts

TE marine mammals are generally expected to be in low densities in the vicinity of the HVDC Transmission System, primarily occurring in the Long Island Sound, and as such the impacts will be insignificant, if they occur. From 1996 to present, the RFMRP cetacean and pinniped strandings and sightings in the nearshore waters of Long Island Sound have occurred mostly in the open Atlantic open section, or the southern shores of Long Island, with cetacean and pinniped strandings and sightings in the Hudson River and Long Island Sound being uncommon (see Figures 8-1 and 8-2). From 1996 to present, the RFMRP sea turtle stranding and sighting in the nearshore waters of Long Island Sound occurred mostly in the open Atlantic open section, or the southern shores of Long Island, with sea turtle stranding and sighting in the Hudson River and Long Island Sound being uncommon (Figure 9-1).

Most marine mammals are expected to move away from the construction activity as it approaches. Underwater trenching activities associated with cable installation may cause a temporary and localized period of increased turbidity. Although high levels of turbidity can impede navigation and feeding of marine mammals, the increase in turbidity is expected to be insignificant and will not affect the ability of marine mammals and sea turtles to navigate or feed in the area. In general, the suspended sediments from construction activities are expected to settle quickly out of the water column or be dispersed by the flow of the river and tidal currents along the underwater cable route. Since marine mammals and sea turtles are generally expected to be in low densities in the vicinity of the HVDC Transmission System and turbidity will be of short duration, any impacts to marine mammals and sea turtles resulting from turbidity will be insignificant.

The construction of the proposed HVDC Transmission System is expected to cause a temporary, short-term impact on the benthic habitat which may potentially support benthic prey items for several of the TE species. Disturbance of the seabed from trenching during installation of the cable is expected to impact the local benthic communities within the footprint of the cable construction zone. Jetting and/or plowing could potentially cause mortality of sessile benthic infaunal organisms (e.g., polychaete and oligachaete worms), thus potentially having a temporary, local impact on food availability for some marine mammals and sea turtle species. However, the marine mammals and sea turtles are expected to feed in surrounding, unaffected areas, and therefore impacts from temporary and localized reductions in available benthic food sources are expected to be insignificant. Recruitment and recolonization of the benthic infaunal communities is expected to begin following construction. The temporary impact on benthic prey resources will have an insignificant impact on marine mammal and sea turtle species that feed on more motile epifaunal organisms (e.g., crabs, mysids, and sand shrimp) or fish, since these organisms will re-occupy the trenched area after construction. In addition, the construction zone represents a narrow linear disturbance, whereby these species can easily forage in adjacent areas. For this reason, most of the marine mammal and sea turtle species in the HVDC Transmission System area are expected to continue to feed in the area following cable installation.

During the installation of the proposed cables, a number of vessels, including tugs, barges, cranes, and workboats will be employed. Each of these vessels contains fuel, hydraulic fluid, and potentially other hazardous materials with the potential for a spill. The Facility will be constructed with an SPCC Plan or its equivalent that will address measures for preventing, controlling, and cleaning up spilled fluids. For larger spills, the Applicants will engage a firm with rapid response capability for containing and cleaning up the spilled material. The navigable waters of the proposed cable route are frequented by various vessels on a daily basis; therefore, introduction of construction vessels to the area during the construction period will represent an insignificant increase in the potential for an oil or fluid spill compared to existing conditions.

Marine mammals rely on sound for many aspects of their lives, including reproduction, feeding, predator and hazard avoidance, communication, and navigation (Weilgart 2007). There is considerable variation among marine mammals in both absolute hearing range and sensitivity. Their composite range is from ultrasonic (frequencies greater than 20 kHz) to infrasonic (frequencies less than 20 Hz). Direct hearing measurements, for the most part, are not available for cetacean species, but it is generally believed that a whale's hearing range is related to the range of sound it produces (LGL and JASCO Research 2005). Behavioral responses of marine mammals to sound vary greatly and depend on a number of factors. An individual's hearing sensitivity, tolerance to noise, exposure to the same noise in the past, behavior at the time of exposure, age, sex, and group composition all affect how it may respond. Sometimes it is difficult to know whether observed changes in behavior are due to sound or to other causes. Not all changes in behavior are cause for concern. Observations suggest that marine mammals tend over time to become less sensitive to those types of noise and disturbance to which they are repeatedly exposed (Richardson et al. 1995).

The hearing capabilities of sea turtles are poorly known. Direct hearing measurements have been made in only a few species. These experiments indicate that sea turtles generally hear best at low frequencies and that the upper frequency limit of their hearing is likely about 1 kHz. McCauley et al. (2000 *as cited in* LGL and JASCO Research 2005) observed the responses of a caged green turtle and a loggerhead turtle to the approach and retreat of an operating seismic airgun. Those animals noticeably increased their swimming activity above a source level of approximately 166 decibels (dB). Above 175 dB their behavior became more erratic, possibly indicating an agitated state. The turtles spent increasingly more time swimming as the airgun level increased. The point at which the turtles showed the more erratic behavior likely indicates the point at which avoidance would occur for unrestrained turtles. To be conservative, it is assumed here that 170 dB represents the threshold at which pulsive sounds elicit a disturbance response in sea turtles.

Certain types of underwater noise during construction activities can potentially cause physical damage and interrupt social behavior for marine mammal and sea turtle species. However, other than a remote possibility of blasting, this HVDC Transmission System does not include those types of underwater construction activities that create physically harmful levels of noise, such as pile driving. In addition to construction, anthropogenic or human-generated noise may include recreational and commercial ship traffic, dredging, oil drilling and production, and geophysical surveys (EIA 2008). For cetaceans, underwater noise is suspected of interfering with the vocalizations of whales which they use for locational purposes. Elevated underwater noise levels cause avoidance behaviors which can prevent feeding in areas of elevated noise levels or potentially result in separation of individuals due to differing levels of avoidance response. However, given the low occurrence of listed marine mammals in the Facility area, coupled with the lack of construction activities that create high sound levels, underwater noise is likely to have an insignificant effect on marine mammals and sea turtles.

Sea turtles and whales are slow swimming species and transiting vessels associated with cable installation have the potential to collide with them in the Hudson River. The probability of collision is insignificant considering the limited presence of whales and sea turtle species in the area. Further, the increased number of vessels from construction is insignificant compared to the number and variety of vessels already operating in the Hudson River for commercial transport, fishing, and recreation on a daily basis. The majority of the vessels utilized by the Applicants will travel at slow speed during construction, to avoid and/or minimize the potential for a collision with sea turtles and whales. In particular, the larger vessels will travel slowly, while smaller construction vessels, such as crew or supply vessels have greater maneuverability to avoid whales or sea turtles. The Applicants will continue to consult with state and federal agencies, as well as develop BMPs that will be implemented to avoid and/or minimize any potential impacts on sea turtles during construction.

9.2.5 Other Freshwater Aquatic Species

This section details freshwater aquatic species, other than fish that are TE species, federal candidate species or New York species of special concern for the counties crossed by the transmission cable route. A preliminary review of these species was conducted by searching the NYSDEC (NYSDEC 2009a) and USFWS (USFWS 2009) databases for occurrences in counties along the underwater portions of the proposed transmission cable route. These aquatic species and their habitat requirements are listed in Table 9-7.

9.2.5.1 Dwarf Wedgemussel (Alasmidonta heterodon)

The dwarf wedgemussel is a federal and New York State endangered species that has been recorded in Dutchess and Orange counties. The species typically inhabits areas where fine sediment accumulates over a cobble substrate, in shallow, cool water in either small or large rivers (NYNHP 2009h). In New York, dwarf wedgemussel is primarily distributed in the Delaware River Basin and along the Neversink River in Orange County (NYNHP 2009h). It is also possible in the Housatonic River drainage in Dutchess County (USFWS 2009). Although habitat may exist within the HVDC Transmission System area, the Hudson River does not support any known extant populations. Therefore, the species are unlikely to occur within the vicinity of the HVDC Transmission System.

Four aquatic species listed in New York State have been recorded in counties crossed by the underwater transmission cable construction zone, including two TE species, brook floater (*Alasmindonta varicosa*) and dwarf wedgemussel (*Alasmindonta heterodon*), and two species of special concern, extra-striped snaketail (*Ophiogomphus anomalus*) and pygmy snaketail (*Ophiogomphus howei*). Brook floater is a state threatened mussel species that prefers gravelly riffle habitats along small rivers and creeks (NYNHP 2009i). Although brook floater may occur within tributaries to the Hudson River, it is not expected to occur in the deeper habitats of the Hudson River along the underwater cable route.

The spiny softshell turtle is a primarily aquatic turtle with recently confirmed occurrences in Washington and Albany County. The turtle is listed as a species of special concern. Based on the species' habitat preferences for large rivers, it has the potential to occur in the Hudson River. Microhabitats within and along the Hudson River main channel may also support aquatic life stages of extra-striped snaketail and pygmy snaketail (see habitat requirements in Table 9-7).

9.2.5.2 Avoidance and/or Minimization of Potential Impacts

Based on NYNHP data, habitat requirements, and known species distributions, the Applicants do not anticipate encountering TE species of freshwater mussel. The Applicants have initiated discussions with NYNHP, NYSDEC, and USFWS, and will continue to assess the potential for spiny softshell turtle, extra-striped snaketail, and/or pygmy snaketail to occur within the Facility area along the Hudson River. In general, aquatic species like spiny softshell are expected to move to adjacent areas during ongoing construction activities, and return to the area once construction is completed. If construction activities occur during seasons when dragonfly nymphs are present, impacts may occur from construction and localized sedimentation from underwater construction methods. Given the temporal and local nature of such impacts, they are expected to be insignificant.

10.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section of the application discusses historic and archaeological resources within the Facility's vicinity. The route's proposed alignment includes portions of the Lake Champlain region, the Hudson River Valley, and the New York City (NYC) metropolitan area. Waterways in and around these areas have served as important conduits for transportation, communication, and trade throughout the prehistoric and historic periods. As such, a variety of historic and archaeological resources have been previously reported in the vicinity of the route.

10.1 Prehistoric and Historic Contexts

There is a long and detailed body of research regarding the prehistoric and historic occupations of these regions, including archaeological investigations and historical studies. This discussion of historic and archaeological resources begins with a summary of the prehistoric and historic cultural contexts to provide an overview of the resources potentially located in the vicinity of the route.

10.1.1 Prehistoric Period

Rivers, lakes, estuaries, and coastal areas in the vicinity of the route have been used by Native American groups since the end of the Pleistocene epoch. During the Wisconsinan glaciation, the proposed transmission cable corridor was blanketed by continental glaciers that once extended as far south as Long Island. Glacial retreat at the end of the Pleistocene exposed a landscape that had been significantly modified by ice. The postglacial environment that confronted the first Americans was vastly different than that of the present day, and Paleoindian groups entering the eastern New York region would likely have encountered a mosaic of rapidly changing environments. Paleoenvironmental reconstruction suggests that the extent of environments along the proposed transmission cable corridor may have ranged from spruce parkland and tundra in the north to grasslands along the Atlantic Coastal Plain, near present-day NYC (Carr and Adovasio 2002). The Pleistocene megafauna that initially inhabited this environment (mastodon, mammoth, bison) became extinct at the end of the Late Glacial episode and were replaced by modern species, including elk, moose, and caribou (Carr and Adovasio 2002).

Archaeological evidence suggests that Paleoindian hunter-gatherers entered the eastern New York region at least 11,300 years ago (Laub 2002). Seasonal changes in resource availability meant that Paleoindian groups developed resource procurement strategies that required seasonal migration. Despite this migratory pattern, it is probable that these groups returned to known occupation sites that were located close to critical resources, such as water and lithic raw materials. Intact archaeological sites in the Northeast and in the New England-Maritimes suggest that Paleoindian populations favored rich ecological zones associated with swamps, rivers, and postglacial lakes (Pasquariello and Loorya 2006). Archaeologically, Paleoindian artifact assemblages within the Northeast are dominated by lithic technologies, particularly fluted projectile points, utilized flakes, and smaller bifacial tools, such as scrapers and burins (Carr and

Adovasio 2002). Paleoindian populations also relied heavily on perishable technologies, such as textile, bone, and wooden tools. However, differential preservation of archaeological materials typically makes these technologies far less visible in the artifact assemblages from known sites in the region.

In general, Paleoindian sites are uncommon in the Northeast. A number of factors contribute to the lack of sites from this period. While several fluted points have been recovered along the proposed transmission cable corridor, the age of Paleoindian deposits, subsequent landscape modifications, and associated ground disturbance make the likelihood of encountering intact Paleoindian sites relatively low. Other significant factors that affect the visibility of intact sites include the low population densities during the Paleoindian period, the nature of material culture types common to hunter-gatherer groups, and the general environmental conditions in the region at the end of the Wisconsinan glaciation. The paleoenvironmental landscape was also significantly altered by natural environmental conditions precipitated by a host of processes, including isostatic rebound, post-glacial eustatic sea level rise, and concomitant changes in characteristics of alluvial environments. These and other natural processes have further obscured the relationship between the paleoenvironment and the modern landscape.

A warming climate and a greater ecological diversity following glacial retreat prompted changes in subsistence strategies and technologies (Ritchie 1965). The Archaic period (10,000 to 3,000 years ago) saw the emergence of mixed deciduous-coniferous forests and the appearance of essentially modern faunal assemblages in the Northeast (Quinn et al. 1999). Technological developments, such as smaller projectile points, indicate a trend towards hunting strategies that relied on smaller, locally available fauna, such as white-tailed deer, turkey, waterfowl, and black bear. Seasonal availability of game animals, aquatic resources, and wild plant foods continued to make hunting and foraging successful resource procurement strategies, particularly in coastal areas. These strategies contributed to a population growth throughout the Northeast during the Archaic period (Fagan 2000).

Although the Early Archaic is poorly understood in New York, sites from this period have been identified in the upper Hudson River drainage and in the southeastern portion of the state. Projectile points associated with the Early Archaic have been found along the Hudson River Valley, but single-component sites have not been excavated in this region.

Within the vicinity of the route, the Middle Archaic is characterized by an adaptive strategy that relied on a combination of hunting, fishing, and gathering (Pasquariello and Loorya 2006). Middle Archaic sites are typically associated with rivers, swamps, lakes, estuaries, and coastlines. The proximity of these sites to existing waterways suggests that Middle Archaic populations were exploiting seasonal fish runs and bird migrations along the Eastern Flyway (Pasquariello and Loorya 2006). The emergence of ground and polished stone tools during the Middle Archaic indicate that techniques to process nuts and edible plants were also becoming better refined during this stage (Ritchie 1965).

The Late Archaic saw the fluorescence of a number of cultural manifestations across the Northeast. In the vicinity of the route, Late Archaic sites from the Laurentian Tradition and the Lamoka phase have been identified. While the relationship between these two phases in New

York is somewhat unclear, it is apparent that by the Late Archaic cultural diversity was expanding rapidly (Quiggle 2008). The settlement patterns that developed in resource-abundant areas suggest the use of seasonal base camps to augment migratory resource procurement strategies. This semi-sedentary pattern is represented by an increase in the number house structures, storage pits, and larger quantities of organic food remains (Quinn et al. 1999; Ritchie 1965). While typical Late Archaic sites in the vicinity of the route continue to be relatively small, they are found on all landforms and environmental areas.

Archaeologists have long recognized a Terminal Archaic period that bridges the Archaic and Woodland periods in the Northeast (Ritchie 1965). Characteristics of the Terminal Archaic include the use of steatite cooking vessels and the appearance of Orient Fishtail projectile points. Orient Fishtail points are typically found throughout the Long Island, southern New England, and the Hudson River Valley, although morphological correlates have been identified throughout the Northeast (Justice 1987).

The most significant technological development to occur during the Woodland period (3,000 years ago, AD 1550) was the widespread manufacture and use of ceramic vessels. Ceramic vessels appeared in isolated areas in eastern North America during the Late Archaic, but became only regionally significant in the Northeast approximately 3,000 years ago (Quinn et al. 1999). Ceramic manufacture reflects increasingly sedentary settlement patterns and a growing dependence on domesticated plants, although evidence for cultigens is somewhat lacking for much of the Northeast during the Early Woodland period.

While a variety of cultural manifestations continued to appear throughout the Woodland period, a regional assessment indicates that Middle Woodland populations continued a shift toward more sedentary communities. Marine resources, particularly shellfish, became increasingly important during the Middle Woodland, and researchers have identified an increase in coastal and riverine settlements during this period (Pasquariello and Loorya 2006).

Maize, bean, and squash agriculture became an important source of subsistence during the Late Woodland period (Quiggle 2005). Major sociopolitical changes accompanied the widespread adoption of cultivation practices, including increased territorialization and changes in residence patterns. These changes led to the emergence of an identifiable Iroquoian Tradition within western, central, and northern New York State by AD 1300. At the time of European contact, people speaking closely related Eastern Algonquian dialects occupied southern New England, eastern Long Island, and sections of the Hudson River Valley, near present-day Albany (Pasquariello and Loorya 2006; Ritchie 1965).

Large, nucleated semi-permanent Iroquoian settlements were originally located along floodplains, river terraces, or coastlines. However, by the 1300s, Iroquoian communities began to relocate villages to defensible upland areas. In many cases, these villages were protected by stockade walls erected as an additional fortification. Conversely, Algonquian-speaking populations in the route’s vicinity generally occupied small, decentralized camps. Both Algonquian and Iroquoian communities were oriented around maize, bean, and squash cultivation in fields near settlements. Temporary upland camps and task-specific activity sites augmented the resources available in the lowland areas surrounding villages.

In contrast to their Iroquoian and Algonquian-speaking neighbors, southeastern New York was occupied by people speaking a Munsee dialect of the Delaware language at the close of the Late Woodland. The Munsee cultural area stretched along the "Lower Hudson River Valley and across western Long Island across southeastern New York and northern New Jersey to northwestern Pennsylvania above the Forks of the Delaware" (Grumet 1995). Sixteenth century Munsee, Iroquoian, and Algonquian-speaking populations apparently shared many common life-ways typical of Late Woodland peoples in the Northeast. However, there is little archaeological evidence to indicate that Munsee communities cultivated plants prior to European arrival in the Americas. The lack of arable soils, dearth of archaeological evidence of agriculture, and the abundant marine resources in the region all suggest that the Munsee's primary resource procurement strategy emphasized hunting, fishing, and gathering practices (Grumet 1995). Archaeological evidence indicates that semi-sedentary Late Woodland Munsee communities were located along major drainages and coastlines, but it does not appear that they built fortified villages.

10.1.2 Historic Period

Ephemeral contact between Native Americans and Europeans along the Atlantic Coast of North America may have begun as early as the 1490s. Unverified evidence from archival records indicates that European fishing fleets may have made landfall along the coast of Newfoundland and the Gulf of St. Lawrence toward the end of the 15th century (Grumet 1995). In 1524, Italian explorer Giovanni da Verrazzano made the first documented contact with Native Americans along the Atlantic seaboard. Shortly after Varrazzano's encounter, French explorer Jacques Cartier traveled inland along the St. Lawrence River to present-day Montreal and made contact with St. Lawrence Iroquoian groups that occupied the region. Hostilities between Native Americans and the French limited trade relations and stifled European attempts to establish a colony in the region during the 1500s (Grumet 1995). Notwithstanding these difficulties, archaeological evidence indicates that European trade items were obtained by indigenous coastal groups from European fishing and whaling fleets and made their way inland through trading intermediaries during the 16th century (Quiggle 2008).

The 17th century was a period of tremendous social and political upheaval across the entirety of Northeastern North America. Sustained contact in the vicinity of the route began with Samuel de Champlain's exploration of the region in 1609 (LCMM 2009a). The same year, Dutch explorer Henry Hudson navigated the river that now bears his name north to the present-day City of Albany (Grumet 1995). European settlers that soon followed these explorers encountered an indigenous population wracked by epidemic diseases brought from the Old World. Waves of epidemics killed thousands of Native Americans living in the Northeast during the early contact period. These epidemics were compounded by internecine hostilities fostered by competition for access to European trade goods (Quiggle 2006). Warfare among indigenous populations would kill thousands of Native Americans and force others to flee the region during the 17th century (Grumet 1995).

Territorial expansion also caused conflict between Native Americans and European settlers pushing inland up the Hudson, Connecticut, and St. Lawrence River valleys. Regional conflicts such as the Pequot War ravaged both Indian and colonial communities. European settlers and their Indian allies also attacked other settlements in the Northeast in an attempt to wrest political control of the region (Grumet 1995). These conflicts were primarily motivated by access to trade goods and Old World rivalries that spread to the colonies. Defenses sprang up at sites along the Champlain Valley as the French and British struggled for control of waterways that provided transportation for furs and other trade items (LCMM 2009b). In the southeast of the region, NYC passed through Dutch hands twice before finally falling to the English in 1673 (Grumet 1995). Similar struggles for military control over important waterways and ports would continue throughout most of the seventeenth and eighteenth centuries.

Despite widespread conflict, the European powers were able to gain a tentative foothold in the region. By the 18th century, farms dotted the Hudson River Valley, and cities such as Kingston, Albany, and New York had become important English strongholds in the New World. The Champlain Valley remained a contested area throughout this period, and the French attempted to solidify control over the important transportation route provided by Lake Champlain through construction of a series of defenses at Crown Point (LCMM 2009b). In 1754, French attacks on a British fort along the Connecticut River reignited large-scale regional conflict. The Champlain and Lake George regions became hotbeds of military activity during the French and Indian War, as the colonial powers and their Indian allies fought a bloody and protracted battle for control of the continent. After the fall of Fort William Henry, France was able to exercise military control over the region through its naval forces on Lake Champlain and the French forts at Ticonderoga, Crown Point, and Chimney Point (LCMM 2009b). This control was short-lived, as the British returned with a large naval flotilla in 1759. British troops and warships attacked French ships on Lake Champlain and the garrisons at Crown Point and Ticonderoga. Undersupplied and outnumbered, France lost control of its major fortifications in the region by 1760. The 1763 Treaty of Paris ended the French and Indian War and brought a temporary peace to the Champlain Valley (LCMM 2009b).

The Eastern Seaboard was again the scene of conflict during the American Revolution. From Lake Champlain to Long Island, the entire State of New York was embroiled in the struggle for American independence. At the outset of the conflict, American forces under Ethan Allen and Benedict Arnold captured the British fortifications at Ticonderoga and Crown Point in a daring surprise attack. Subsequent victories in the region gave the Americans control of the lake and access to Canada. Despite these early successes, the attempt to invade Canada ultimately failed, and the American Army was forced to retreat overland in early 1776 (LCMM 2009c). The Americans were able to command Lake Champlain with a small naval force that included captured British vessels and ships built at local American shipyards on the lake. This control ended in 1776, with the British defeat of the American naval forces at the Battle of Valcour Island. Notwithstanding this naval success, the British were unable to dislodge the American forces from the redoubts at Ticonderoga and Mount Independence during the 1776 campaign. Consequently, the British again returned to the Champlain Valley in 1777 (LCMM 2009c). British General John Burgoyne was able to secure the undefended Mount Defiance above the American garrisons and fired a fusillade from cannons stationed on the high ground. The American forces were forced to retreat and to relinquish control of Lake Champlain throughout the remainder of the war (LCMM 2009c).

In the south, New York became an occupied city after the fledgling American Army fled north following the Battle of Long Island (Pasquariello and Loorya 2006). North of New York, present-day Westchester County was known as the “Neutral Ground” that separated the British and American forces. Despite this moniker, Westchester County was the scene of the battles of Pelham and White Plains in 1776 (Pasquariello and Loorya 2006). The region was home to both Tory sympathizers and revolutionaries, and it remained a hotbed of partisan activity throughout the war.

Early in the conflict, both the American and British forces recognized the strategic importance of controlling traffic on the Hudson River. The Americans attempted to block the British fleet from gaining access to the interior by constructing an iron chain across the river near Fort Montgomery (USMA 2009). When this attempt failed, General George Washington sought to establish fortifications upstream from Fort Montgomery at a high plateau with commanding views of the river valley. In 1779, an American military garrison was established at West Point, near the present-day village of Highland Falls, New York. The fortifications included a 150-ton iron “Great Chain” strung across the Hudson to control river traffic. Although the Great Chain was never tested by the British fleet, the garrison nearly fell into British hands toward the end of the conflict (USMA 2009). In 1780, Benedict Arnold was given commend of West Point. Arnold’s attempt to pass detailed plans of the fortifications to the British was discovered, and Arnold narrowly escaped down the Hudson on a British sloop. Today, the garrison at West Point is home to the United States Military Academy (USMA), and is the oldest continuously occupied military outpost in the United States (USMA 2009).

A critical American victory took place upriver from West Point near Albany, New York. In 1777, American forces defeated Burgoyne’s army at the Battle of Saratoga, giving the Americans an important strategic victory. Often called the turning point of the American Revolution, the victory at Saratoga also convinced the French to ally themselves with the Americans (NPS 2008). With the assistance of the French, the American forces were able to defeat the British at the Battle of Yorktown in 1781. The conflict was formally ended with signing of the Treaty of Paris in 1783.

The 19th century was characterized by increased economic growth throughout the region. The War of 1812 brought further conflict to the Champlain Valley, as British and American forces again sought control of Lake Champlain. The defeat of the British Royal Navy in 1814 essentially ended the era of naval fleets on the lake and brought a sustained peace to the region (LCMM 2009d). While raw materials such as timber, potash, and iron were becoming economically important, growth in the Champlain Valley was complicated by the difficulty in transporting raw goods and bulk materials south to processing and manufacturing centers (LCMM 2009e). The construction of the Champlain Canal between 1817 and 1823 provided a vital link between communities in the north and manufacturing centers along the Hudson River and the Atlantic seaboard (HAA 2009). The canal underwent several realignments and improvements throughout the 1800s to accommodate increased traffic and larger vessels.

Brick manufacturing, quarrying, iron smelting, and ice cutting became important industrial activities along the Hudson River Valley during the 19th century, fueled in part by the successes of the Erie and Champlain Canals that connected distant markets (Pasquariello and Loorya

2006). The growth of the railroads decreased the significance of the canal system, but brought new economic benefits to the region. Although the northern sections of Manhattan had remained sparsely populated and primarily agrarian throughout the 18th century, the influx of immigrants into the NYC region provided an important stimulus for the growth of the city during the 19th century. Commercial shipping and manufacturing supported NYC's rise as a regional and national economic center, and similar activities along the coastline of Long Island Sound allowed for the development of cities such as Stamford, Connecticut.

The Champlain Canal was replaced by the modern Barge Canal in the early 20th century. Although the Barge Canal was an attempt to revitalize the canal system, commercial traffic peaked in the 1890s and has continued to decrease. Today, Lake Champlain and the Champlain Valley remain popular recreation destinations. South of the canal, the Central New York region is centered on the capital city of Albany. The lower Hudson River Valley experienced increased suburban growth and development following World War II.

The NYC region continues to be one of the largest population centers in the United States, with an increasing dependence on the financial and service sectors. While the western section of the Long Island coastline is characterized by urban and suburban development associated with NYC, the eastern portion of the coast has become a tourist destination.

10.2 Existing Historic and Archaeological Resources

Although previous studies have identified several historic and archaeological resources in the route's vicinity, the varying levels of analyses and investigation conducted for these studies have resulted in vastly different degrees of reporting and evaluation. At one end of this spectrum, resources within the proposed transmission cable corridor include "historic properties" that have been listed in or determined to be eligible for inclusion in the National Register of Historic Places (National Register). These historic properties include significant buildings, structures, sites, districts, and individual objects that meet the National Register Criteria for Evaluation (36 CFR § 60.4).

A smaller subset of historic properties within the vicinity of the route have been designated as National Historic Landmarks (NHL) by the Secretary of the Interior. These NHL properties are considered significant historic places that possess exceptional value or quality in illustrating or interpreting the heritage of the United States.

Resources in the route's vicinity also include properties listed in or eligible for inclusion in the New York State Register of Historic Places (State Register), established under § 14.09 of the New York State Preservation Act of 1980 of the Parks, Recreation and Historic Preservation Law (§14.09) and administered under the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP). All historic properties within the State of New York listed in or nominated for inclusion in the National Register are concurrently listed in the State Register.[10]

Other sites reported in the vicinity of the cable transmission route and aboveground facilities have not been subject to the same level of study or evaluation as properties listed in or determined eligible for inclusion in the State or National Registers. The nature and quality of available data regarding these unevaluated sites often varies significantly. In several instances, documentation regarding the integrity or geographical boundaries of these sites has not been collected or is not presently available. Several archaeological sites recorded during the early 20th century fall into this category, as do many of the shipwrecks reported along waterways that comprise the majority of the transmission cable corridor. Many of these resources may potentially be eligible for inclusion in the National Register. However, in other instances, the integrity of these reported sites may be compromised or their geographical extent inaccurately reported. In either case, there is insufficient information currently available regarding these sites to make a recommendation or determination regarding their eligibility.

In addition to the resources discussed above, designated NYC Landmarks have also been identified within the general vicinity of the route. NYC Landmarks and Landmark Districts are designated by the City of New York Landmarks Preservation Commission (LPC) to preserve important physical elements of NYC. Many of these Landmarks and components of Landmark Districts also share distinction as historic properties listed in or determined eligible for inclusion in the National Register.

Other related resources within the vicinity of the route include National Heritage Areas, including the Erie Canalway National Heritage Corridor. National Heritage Areas are designated by Congress and administered through a partnership between the NPS and local coordinating entities. The goal of the National Heritage Program is to expand on traditional approaches to conservation by supporting large-scale, community centered initiatives that engage citizens in the preservation and planning process. While these National Heritage Areas contain historic resources listed in or eligible for inclusion in the National Register, the heritage areas themselves are not considered historic properties as defined in 36 CFR § 800.16(l).

In addition to the National Heritage Areas, the route's proposed alignment is encompassed within several New York State Heritage Areas, including the Mohawk Valley Heritage Corridor, "RiverSpark" (Hudson-Mohawk) Heritage Area, Whitehall Heritage Area, Saratoga Springs Heritage Area, Schenectady Heritage Area, Kingston Heritage Area, and Ossining Heritage Area. Similar to the National Heritage Areas, State Heritage Areas also contain properties listed in or eligible for inclusion in the National Register, but the areas themselves are not considered historic properties. The route does not represent a conflict with the goals, strategies, or identified resources of these resource areas. Installation of cables underground, underwater or at bridge attachments will not result in significant visual impacts in the route area.

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[10] The State Register also includes a limited number of properties that have not been listed on the National Register. However, none of these properties occur within the vicinity of the Project based on research completed by Hartgen and a review of the NYSOPRPHP on-line database.

Federal, state, and local statutes governing the protection of historic properties have applicability to the proposed route. Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (Section 106), establishes the statutory responsibilities of federal agencies to consider the effects of their undertakings on historic properties listed in or eligible for inclusion in the National Register. Because the Applicants will be required to obtain federal permits, Section 106 and its implementing regulations at 36 CFR § 800 are applicable to the entire undertaking. 36 CFR 800 defines the procedures for identifying historic properties in consultation with federally recognized Indian tribes, the applicable State Historic Preservation Office (SHPO), and other parties, including the public.

In addition to Section 106, portions of the route to be approved by the NYSPSC are subject to the provisions of §14.09. §14.09 requires state agencies to consult with the SHPO if it appears that any project may cause any change, beneficial or adverse, to historic properties listed in or eligible for inclusion in the National or State Registers of Historic Places. NYSDPS asserts that while federal review may be pending at the conclusion of the current NYS review for the ongoing Article VII application, the NYSDPS will continue to comport with requirements of NYS Parks, Recreation and Historic Preservation Law (PRHPL) §14.09. Furthermore, NYSDPS review of the route's Heritage Area impacts, and conformance with heritage area management plans, must comport with PRHPL §35.

The LPC serves as the city's expert agency for historic resources and is typically consulted prior to authorizing projects that require discretionary action by city agencies. Pursuant to the New York City Landmarks Law of 1965, the LPC is also the agency responsible for regulating construction and improvements at NYC Landmark sites and districts.

The consultation procedures required pursuant to these applicable statutes will be coordinated during the permitting process. The consultation process, identification, and assessment requirements described in 36 CFR 800 provide the opportunity to address the requirements of §14.09 and requirements promulgated by the LPC. Accordingly, the Applicants anticipate that the Section 106 process will guide the identification of historic properties and the assessment of routing effects.

The USDOE will serve as the lead federal agency for purposes of consultation pursuant to Section 106, as a result of the Applicants' submission of an application for a Presidential Permit in early 2010. Consequently, the USDOE remains largely responsible for the findings and determinations made through the Section 106 process. As provided in 36 CFR § 800.2(c)(4), the USDOE may authorize the Applicants to act as the agency's non-federal designee for purposes of consultation under Section 106.

The Section 106 process requires identification of historic properties within the Area of Potential Effects (APE) of the route, through consultation with the SHPO, Indian tribes, and other stakeholders. Although the APE for this undertaking has not yet been established, the Applicants anticipate that will include all areas along the transmission cable corridor and new access roads where ground- disturbing activities will be conducted. The APE will also likely include areas outside the transmission cable corridor, including the converter station sites, the AC cable alignment, transmission interconnection sites, laydown areas, and other locations that may be affected by cable construction and operations. Additionally, the APE will take into account standing historic properties (i.e., buildings, structures, individual objects, and districts) that may be indirectly affected by the undertaking.

Section 106 requires identification of historic properties in consultation with the parties discussed above. The Applicants have initiated preliminary studies to identify resources that may be affected by cable construction and operation. Details of these preliminary identification efforts are described in Section 10.2.1 below. The Applicants anticipate that additional studies to identify historic resources and to assess the effects on such properties will be developed in consultation with the SHPO, Indian tribes, the LPC, and other stakeholders. These studies will include geophysical investigations developed in conjunction with preparation of final design plans. As necessary, appropriate measures to avoid, minimize, or mitigate the adverse effects on these resources will be developed and implemented in consultation with the appropriate parties.

10.2.1 Documentary Research to Identify Known and Potential Historic and Archaeological Resources

In support of this application, documentary research was conducted to identify a wide variety of previously reported historic and archaeological resources within the vicinity of the proposed routing. The results of this research are presented in the sections below. The information collected during this phase of investigation will form the basis for additional consultation activities with the SHPO, Indian tribes, non-governmental organizations (NGOs), the LPC, and other stakeholders whose interests may potentially be affected by construction or operation of the proposed routing.

10.2.1.1 National Register and New York City Landmarks and Landmark Districts

General, publicly available information regarding the location of National Register properties and NYC Landmarks and Landmark Districts was obtained from the New York State GIS clearinghouse. As required by the Article VII regulations, the location of these resources within a 3-mile radius of the route was included in Exhibit 2 of the Application.

10.2.1.2 Pre Phase IA Screening Study and Phase IA Literature Review and Archeological Sensitivity Assessment

Based on the routing as presented in the original Application, Hartgen Archaeological Associates, Inc. (HAA Inc.) conducted documentary research to identify known and potential cultural resources in the vicinity of the proposed route. Several agencies were contacted to obtain information regarding cultural resources in the route's vicinity, including the NYSOPRHP. The NYSOPRHP maintains an inventory of cultural resource studies and previously reported cultural resources within the proposed transmission cable corridor, including terrestrial and underwater archeological sites and other historic properties. HAA, Inc. also consulted the New York State Museum (NYSM) site files maintained by the NYSOPRHP. These site files provide information on archaeological sites previously reported to the NYSM.

As a component of this research, HAA, Inc. also obtained data from the NYSDEC associated with the Benthic Mapping Program for the Hudson River. The high-resolution, 2-meter sun-illuminated bathymetric maps generated by this survey were utilized to assist HAA, Inc. in identifying the locations of shipwreck sites and anomalies in the Hudson River Estuary, extending from Troy to NYC. At the request of the Applicants, the Lake Champlain Maritime Museum (LCMM) also conducted a review of bathymetric data and site files associated with ongoing cultural resources studies in Lake Champlain. Based on these records, the LCMM was able to supplement the research conducted by HAA, Inc. and provide additional information regarding the location, nature, and character of shipwrecks and other submerged resources along the Lake Champlain portion of the route. Other sources consulted to locate and identify reported shipwrecks included NOAA navigation charts, USGS topographic quadrangles, academic reports, historic manuscripts, and studies previously conducted along the waterways that comprise a majority of the route.

In addition to these sources, HAA, Inc. also contacted the LPC to identify resources in the NYC region that may potentially be affected by the routing. The LPC serves as the City's expert agency for historic resources and is typically consulted prior to authorizing projects that require discretionary action by City agencies. Consequently, the LPC maintains an archival library that contains terrestrial archeological site information and data on above-ground resources, such as buildings, structures, and landscapes that have been designated as NYC Landmarks and Landmark Districts. However, the LPC does not maintain data on underwater resources, and could not provide any cultural resource information relevant to submerged resources along the proposed cable alignment.

The documentary research conducted by HAA, Inc. and supported by the LCMM focused on specific study areas to identify previously reported archaeological sites, historic properties, and archaeologically sensitive areas that could potentially be affected by construction or operation of the route. To better characterize the archaeological and historic sensitivity of the route, this research also identified resources that are outside of the proposed transmission cable corridor but are in the general vicinity of the route. The results of this documentary research were compiled into four maps series that provide coverage of the entire alignment, from the United States/Canadian border to Long Island Sound. The maps and associated tables provide available information regarding:

- Identified terrestrial archaeological sites, including properties that are listed in or considered eligible for inclusion in the National Register as well as those sites that have been reported but have not been subjected to additional investigation or evaluation;
- Standing historic properties, including buildings, structures, districts, and individual objects that have previously been listed in or evaluated as eligible for inclusion in the National Register;
- Shipwrecks, submerged sites, or anomalies identified through existing NOAA charts, NYSOPRHP and NYSM site files, studies conducted by the LCMM, and bathymetric data provided by the NYSDEC; and
- The locations of previous cultural resource studies, including a summary of the results of these investigations.

The information presented in the Pre-Phase IA Cultural Resources Screening Report contains detailed and sensitive information regarding the location, nature, and character of reported archaeological sites, historic properties, and shipwrecks located within the route's vicinity. Consequently, the report, maps, and associated tables were submitted in a confidential document to the NYSOPRHP on September 7, 2010.

The Applicants met with the NYSOPRHP to coordinate an approach for conducting additional cultural resources studies to identify historic properties that may be affected by the route. Based on discussions with the NYSOPRHP and other stakeholders, the Applicants retained HAA, Inc. to conduct a Phase IA Literature Review and Archaeological Sensitivity Assessment of the route's prospective APE. HAA, Inc.'s Phase IA background research included an additional review of previous surveys and reports; a historical map review; a search of the NYSM and NYSOPRHP archaeological site files; and an analysis of existing site conditions. The Phase IA report presented an assessment of the archaeological sensitivity and potential of the route's prospective APE. This report also provided detailed recommendations regarding additional Phase IB testing along the proposed transmission cable alignment. In a letter dated March 14, 2011, the NYSOPRHP provided comments on the Phase IA report. The NYSOPRHP concurred with the methodologies presented in the Phase IA report with the additional recommendations provided in the March 14, 2011 correspondence.

The general results of the Pre-Phase IA Screening Study and the Phase IA Literature Review and Archeological Sensitivity Assessment for each section of the route are discussed below.

Lake Champlain

The Lake Champlain section of the route begins at the United States/Canadian border and extends south to the northern entrance of the Champlain Canal at Dresden. The Lake Champlain section extends across a region that was a contested front during the American Revolution. Several well-known historic sites exist within the general vicinity of the route through Lake Champlain, including Fort Crown Point and Fort Ticonderoga. Shipwrecks associated with the military history of the region are also known to exist beneath the waters of Lake Champlain. Many of these resources have been mapped and studied through the ongoing efforts of the LCMM.

For this section of the route, HAA, Inc. reviewed NYSOPRHP and NYSM site files and other available documentation for a study area that included portions of Lake Champlain within the State of New York and the lake's immediate shoreline. During the siting phase, the LCMM provided supplementary information regarding shipwrecks and other submerged archaeological resources within 1,000 feet of either side of a proposed centerline for the underwater transmission cable route. Based on the information provided by the LCMM and HAA, Inc., the Applicants were able to make minor adjustments to the route's proposed alignment to avoid a majority of the historic properties, unevaluated resources, and reported shipwrecks along this section of the route.

Information regarding the identified shipwrecks, archaeological sites, and historic properties that have previously been reported within the general study area is summarized in the Phase IA Pre-Screening Report and the Phase IA Literature Review and Archeological Sensitivity Assessment.

Railroad Right-of-Way Bypass

In order to circumvent the Upper Hudson River PCB Dredging Project, extending from Fort Edward south to the Town of Coeymans south of Albany, the route presented in the original Application exited the Champlain Canal north of Fort Edward (north of Lock C8) and was proposed to be buried within railroad rights-of-way for a distance of 69.9 miles. The cables entered the Hudson River in the Town of Coeymans, downstream from the City of Albany. There is significant overlap between this route and the route proposed at this point, but additional overland segments have been added.

This underground section of the cable route is generally constrained by the existing railroad right-of-way. As such, HAA, Inc. reviewed NYSOPRHP and NYSM site files and other available documentation for a study area that included 500 feet on either side of the cable corridor centerline for this portion of the route.

Information regarding the identified archaeological sites and historic properties that have previously been reported within the vicinity of the railroad right-of-way bypass route is summarized in the Phase IA Pre-Screening Report and the Phase IA Literature Review and Archeological Sensitivity Assessment.

Hudson River

In the route presented in the Application, the underwater transmission cables entered the Hudson River in the Town of Coeymans, downstream from the City of Albany. South of Coeymans, the originally proposed route followed the Hudson River to the NYC metropolitan area. The current route now follows CSX railroad ROW south of Coeymans, enters the Hudson River in the Town of Catskill and exits the River at Stony Point for an overland bypass of Haverstraw Bay.

This section of the Hudson River has a rich history associated with the prehistoric occupation of the region and the early colonial settlements that eventually gave rise to present-day NYC. Several nationally significant historic properties exist along this section of the route, including the USMA at West Point and the Stony Point Battlefield.

For this section of the route, HAA, Inc. reviewed NYSOPRHP and NYSM site files and other available documentation for a study area that included the entire width of the Hudson River and the river's immediate shoreline. The NYSDEC also provided high-resolution bathymetric data that was reviewed to identify the locations of potential shipwrecks along the Hudson River. The bathymetric images revealed the presence of several anomalies on the river bottom that may indicate the presence of sunken vessels or other significant cultural deposits. Where possible, the information presented in the bathymetric images was also compared with other sources to corroborate the locations of shipwrecks and other underwater sites such as historic bridge structures. Based on the information compiled from the bathymetric images, the Applicants made minor adjustments to the cable alignment to avoid, to the extent practicable, all shipwrecks and anomalies along the Hudson River section of the route.

Information regarding the identified shipwrecks, archaeological sites, and historic properties that have previously been reported within the vicinity of the underwater portion of the Hudson River route is summarized in the Phase IA Pre-Screening Report and the Phase IA Literature Review and Archeological Sensitivity Assessment.

A Phase IA study has not been completed for the Lake Champlain bypass along the Route 22 right-of-way, the area along the Haverstraw Bay bypass, the Luyster Creek converter station, or the proposed terrestrial route extension from the Luyster Creek converter station to the Rainey substation. The Applicants anticipate additional Phase IA studies will be completed in 2012.

Harlem River and East River

As proposed in the Application, two of the transmission cables (one bipole system) would have continued through the Hudson, Harlem, and East Rivers to Long Island Sound. The current route includes the Harlem River to railroad yards in the South Bronx, and a crossing of the East River. The HVDC converter station is proposed to be located in the vicinity of Luyster Creek north of 20th Avenue in Astoria. There will also be a short (<0.5 mile) segment of HVAC cables connecting the converter station to a nearby substation at Astoria and a three (3)-mile segment of HVAC cables connecting the Astoria Substation to the Rainey Substation.

As the cable route follows these waterways through the NYC metropolitan area, it traces a route through one of the most historically significant regions on the East Coast. Archaeological sites, buildings, structures, and other resources known to exist within the route's vicinity are associated with the prehistoric occupation and early European settlement in United States. Other resources reflect the military history and the diverse heritage of the NYC area, including Fort Schuyler, the Robert F. Kennedy Bridge (formerly known as the Triborough Bridge), and other remnants of growth and development in NYC. The maritime history of the region is visible in its historic resources, including the Execution Rocks Lighthouse and the State University of New York Maritime College.

For this section of the underwater transmission cable route, HAA, Inc. reviewed NYSOPRHP and NYSM site files and other available documentation for a study area that included the entire width of the Harlem River and East River as well as its immediate shoreline. Information regarding the identified shipwrecks, archaeological sites, and historic properties that have previously been reported within the vicinity of this section of the cable route is summarized in the Phase IA Pre-Screening Report and the Phase IA Literature Review and Archeological Sensitivity Assessment.

10.2.1.3 Phase 1B Archeological Field Reconnaissance

The Applicants authorized HAA to initiate a Phase 1B Archeological Field Reconnaissance based on the recommendations for future work presented in the Phase 1A study. The authorized work consisted of shovel testing with the Area of Potential Effects (APE) along the upland portions of the route, backhoe trenching in areas where hand-excavation with shovels was unable to penetrate into soils where deeply buried deposits might occur, and monitoring of the cable installation at a future date. Shovel testing was largely completed within the CP Railroad right-of-way from Whitehall to Rotterdam. While no report has been submitted, HAA reported the following unofficial results to the Applicants:

- Twenty archeological sites were identified.
- Of the twenty sites, one is solely a pre-contact (Native American) site, 17 are historic, and 2 have both precontact and historic components.
- It is likely that little to no additional work will be necessary for many of the sites identified. None of the sites should pose a significant obstacle to the completion of the project.
- Additional excavations consisting of a total of 200 shovel tests and 12 units were excavated within many of the 20 sites to provide additional information to determine significance. Therefore, a total of 3,626 tests were excavated for the original Phase IB and supplemental testing within sites.

Due to railroad safety policies, access to the CSX Railroad could not be obtained prior to the close of the field season. In addition, no work has begun on the Lake Champlain bypass along the Route 22 right-of-way, the area along the Haverstraw Bay bypass, the Luyster Creek converter station, or the extended terrestrial route from the Astoria Substation to the Rainey substation. As appropriate, the Applicants anticipate additional field work will be completed in 2012.

10.2.1.4 Lake Champlain Maritime Museum Remote Sensing Analysis

On February 22, 2011, the LCMM delivered a report detailing an analysis of remote sensed data to identify underwater cultural resources. The analysis drew upon a LCMM side scan data of Lake Champlain, NYSDEC surveys of the Hudson River, Marine Route Survey completed by the Applications in the Spring of 2010 and other sonar and magnetomer data collected by other consultants. The LCMM performed a simultaneous analysis of the multiple datasets to identify anomalies and determine the likelihood that these represented potential cultural resources. The analysis yielded 55 anomalies in Lake Champlain and 328 anomalies in the Hudson River within the 800-meter analysis corridor. The LCMM, New York SHPO, and the Applicants met in March of 2011 to review the results.

10.2.1.5 Screening Review of Astoria-Rainey Extension

The Applicants have proposed to extend the transmission line along a terrestrial route extending from the Astoria Substation to the existing Rainey substation adjacent at the intersection of Vernon Boulevard and 36th Avenue in the Borough of Queens. The Rainey substation is located along the shoreline of the East River, opposite Roosevelt Island. The Applicants have reviewed publicly available data regarding the nature and character of historic properties along this section of the proposed extension of the terrestrial route. This approximately three mile-long section of the transmission line route is located in an area categorized by the NYSOPRHP as archaeologically sensitive.

A number of previously reported archaeological sites have been mapped in Astoria, including precontact and historic period sites. Many of these sites were reported to the NYSM during the 1920s through the 1940s but were not investigated to determine if archaeological deposits remained intact. More recent archaeological studies in the vicinity of the transmission line extension indicate that approximately 10 to 12 feet of urban fill underlie portions of the western section of Astoria. These findings are consistent with the historic development of the area that transformed swamps and estuaries into urban land (Historical Perspectives, Inc. 1988). Given the amount of fill likely to be present along the proposed terrestrial section of the route, the likelihood of construction activities impacting archaeological resources is anticipated to be minimal. Nonetheless, the Applicants anticipate conducting a Phase IA assessment of the proposed Astoria to Rainey extension in 2012 to indentify previously reported archaeological and/or historic resources along this section of the transmission cable's alignment. At this time, the Applicants anticipate that archaeological monitoring of construction activities will occur along this section of the route.

There are no properties listed on the National Register or designated as NYC Landmarks within 500 feet of this section of the route. The transmission cable will be placed primarily beneath the pavement of existing roadways and is not expected to directly or indirectly impact any historic buildings or structures.

10.3 Avoidance and/or Minimization of Potential Impacts

The Applicants and NYSDPS have maintained contact and consultation with the NYSOPRHP Historic Resources Bureau, in accordance with Parks, Recreational and Historic Preservation Law §14.09, during the review of the route. General provisions for resource evaluation, avoidance and impact minimization have been developed, and additional detailed analysis, planning and mitigation design will be detailed in a Cultural Resource Management Plan to be developed in further consultation with the SHPO and DPS staff (and other consulting parties in the pending National Historic Preservation Act Section 106 project review for necessary federal licenses). Details of cultural and heritage resource site avoidance and protection measures will be addressed as appropriate in the EM&CP.

10.3.1 Impact Assessment

The route has the potential to affect archaeological sites, historic properties, and shipwrecks, including those resource listed in or eligible for inclusion in the National Register. The route will be located along historically significant waterways in New York that have been designated as archaeologically sensitive by the NYSOPRHP. This corridor follows sections of waterways where historic shipwrecks have been reported and which may potentially include deposits associated with adjacent archaeological and historic sites located along the shorelines. To the extent practicable, existing shipwreck data, archaeological site information, and other resources have been reviewed to site the transmission cables in locations that will not directly affect these resources. However, there are instances along the route where avoidance is not practical and where the transmission cable corridor will intersect with reported historic resources. In particular, the route travels through the boundary of the Crown Point NHL, the Fort Ticonderoga

NHL, and the boundaries of other historic properties along the lower Hudson River that extend into the waterway.

Underground sections of the route intersect with reported archaeological sites that extend through the railroad right-of-way. Although most of these sites have not been evaluated for inclusion in the National Register, they may meet the criteria for eligibility. A significant number of both prehistoric and historic archaeological sites have been identified along the route, including several properties that are listed in or considered eligible for inclusion in the National Register. Construction of the route has the potential for ground disturbance that may affect the integrity and character-defining features of archaeological sites, including shipwrecks, located within the transmission cable corridor.

The transmission cables will also be located in the vicinity of historic buildings and structures, including historic canalways and their associated infrastructure and historic bridges along the Hudson River, Harlem River and East River. As an example, the allowed deviation zone could allow for the installation of the cables within the footprint of the old Champlain Canal towpath from Poultney Avenue south to CP crossing north of Ryder Road. This alignment, if selected, would assist in the development of a 4-mile section of the proposed Champlain Canalway Trail, and advance an identified goal of the New York State Open Space Conservation Plan. The cables would be buried entirely within land owned by CP Railroad.

The route is also located within National Heritage Areas and New York State Heritage Areas. The likely impact on these areas is described as follows:

- Erie Canalway National Heritage Corridor: The Erie Barge Canal at the Mohawk River will be crossed by new bridge attachments at the location of old, defunct cable attachment brackets or cross underneath the Canal via HDD. Clearing at river-canal banks and at the top of banks will be avoided to maintain forest cover. There will be no significant clearing of vegetation at the banks of the river. These measures will ensure that nominal change in the appearance of the heritage corridor occurs at the site of the cable crossing. The route will not conflict with the objectives or specific recommendations of the Erie Canalway National Heritage Corridor Preservation and Management Plan.
- Mohawk Valley Heritage Corridor: The route will cross the Mohawk River by new bridge attachments at the location of old, defunct cable attachment brackets or cross underneath the river via HDD. Clearing at river-canal banks and at the top of banks will be avoided to maintain forest cover. These measures will ensure that nominal change in the appearance of the heritage corridor occurs at the site of the cable crossing. The route will not conflict with the objectives or specific recommendations of the Mohawk Valley Heritage Corridor Commission Management Plan.
- The route will cross the Mohawk River by new bridge attachments at the location of old, defunct cable attachment brackets or cross underneath the river via HDD. There will be an insignificant amount of clearing of vegetation at the banks of the river. These measures will ensure that nominal change in the appearance of the heritage corridor occurs at the site of the cable crossing.

- Whitehall Heritage Area: The route will be located entirely underground within the Village of Whitehall, generally using NYS Route 22 and CP Rail transportation corridors for Facility location.
- Saratoga Springs Heritage Area: The route will be located entirely underground within this area, generally using CP Rail transportation corridors for Facility location.
- Schenectady Heritage Area: The route will be located entirely underground within this area, generally using the CP Rail transportation corridor and public streets scheduled for reconstruction for Facility location.
- Kingston Heritage Area: The route will be located entirely within the Hudson River within this area.
- Ossining Heritage Area: The route will be located entirely within the Hudson River within this area.

No significant disruptions or impacts to identified Heritage Area resources are anticipated to occur due to construction or operation of the transmission cables. The transmission cables will also be in the vicinity of other identified areas of cultural significance. The cables will be installed via HDD under the Stony Point State Historical Site as part of the Haverstraw Bay Bypass. At the Rogers Island site in the Village of Fort Edward, the cables will cross the two channels of the Hudson River around Rogers Island by new attachments to the two CP railroad bridges. This location will not add significant visual elements to these historic structures. The Rogers Island site will be crossed on the CP Rail embankment, a filled area between the two Hudson River bridge crossings. Limitations on tree clearing and requirements for restoration of screening trees damaged by construction will avoid and/or minimize impacts due to Facility location. Construction activities will be scheduled to avoid conflicts with major heritage resource events at the Rogers Island site, such as the annual encampment and re-creation event held in the summer.

Routing is unlikely to have a significant effect on standing historic structures within the route's vicinity. The converter station will be aboveground, but the cables will be buried and therefore will not have an effect on the viewshed. The converter station will be designed to match the character of the surrounding area, and is not expected to have an adverse impact on any historic properties in the vicinity. Surveys will be completed for the entirety of the route prior to construction. Route modifications or other measures will be made as necessary to avoid and/or minimize impacts to any sensitive areas identified, as appropriate. No construction will occur in areas that have not been surveyed and NYSOPRHP and NYSDPS staff have reviewed those surveys.

10.3.2 Avoidance and/or Minimization

In the development of the most desirable approach is to maximize the avoidance of impacts in all aspects of a project. Impact avoidance has been incorporated in all major aspects of the routing. Selection of the railroad right-of-way route in order to bypass the Upper Hudson River PCB Dredging Project and sensitive habitats avoids and/or minimizes impacts on cultural resources, since much of this corridor has been previously disturbed. Similarly, the utilization of the Route 22 right-of-way to bypass lower Lake Champlain also reduces the potential for impacts. Use of buried HVDC cable eliminates aboveground components of an overhead transmission line that can adversely affect historic properties, as well as requires a narrower right-of-way. The Transmission System will not require the construction of poles or towers that can mar the viewshed and indirectly affect the integrity and character of historic properties, except potentially at the converter station site where there already exists a significant amount of aboveground utility wires.

The installation of underwater cables will also avoid ground disturbance associated with installing towers or poles, including the disturbance caused by construction vehicles, and wire-pulling equipment. Additionally, underwater cables do not require vegetation management activities that require clearance along a right-of-way. The ground-disturbance associated with clearing and maintaining a traditional, overhead transmission line right-of-way can cause damage to buried archaeological deposits along the entire right-of-way.

In the first instance, the selection of an underwater cable avoids many potential impacts that are associated with an overland route. The installation of the cables in existing waterways will significantly reduce the overall number of sites that could potentially be impacted. Prehistoric and historic period archaeological sites are generally found on landforms suitable for short or long-term habitation, resource procurement practices, defense, and agriculture. While waterways have served as important transportation routes and economic conduits, most archaeological sites and historic standing structures are located along shorelines or in terrestrial areas. Consequently, the selection of an underwater route avoids impacts to these landforms that have the highest potential for archaeological sites or historic standing structures.

Cable installation methods have been selected to avoid and/or minimize the extent of ground disturbance, both on land and in waterways. Underwater cable burial using water jetting entails use of focused, high-powered water jets to avoid impacts along a majority of the underwater route. Similarly, HDD installation at locations where the cables must enter or exit the water will avoid disturbance to the topmost soil layers that generally have the highest potential to contain archaeological deposits.

The use of an underwater cable provides flexibility in cable siting that permits placement to avoid identified archaeological or historical resources. The Applicants' preferred approach is to avoid adverse effects to cultural resources by routing the transmission cable around identified historic properties, reported archaeological sites, shipwrecks, and anomalies identified in waterways. To this end, the Applicants incorporated screening studies into the siting process. The proposed underwater route avoids a majority of identified resources.

The use of planning and design factors to avoid adverse impacts has reduced impacts to identified cultural resources. However, the Applicants recognize that additional studies are required to identify previously unreported archaeological sites and historic properties along the proposed alignment. Additional studies are also necessary to determine the nature, integrity, and extent of archaeological deposits within the APE and to determine the potential effects on properties listed in or eligible for inclusion in the National Register. As described above, the Applicants anticipate continuing consultation with the SHPO, Indian tribes, the NYSDPS Agency Preservation Officer, the LPC, NGOs, and other stakeholders to determine the appropriate level of studies required to identify additional archaeological and historical resources that may be affected. At a minimum, the Applicants anticipate that these studies may include additional field investigations of select sections of the Facility's route and archaeological monitoring of construction along other sections of the alignment. In addition to these field activities, a comprehensive geophysical survey, including side-scan sonar and bathymetric imaging, will also be conducted as part of the preparation of final design plans. Based on the results of these studies, consultation with the parties described above will be required to develop measures to avoid and/or minimize impacts to identified resources, as appropriate. If necessary, the underwater route and resource protection protocols may be further modified to avoid impacts to significant cultural resources as part of the EM&CP stage of the Facility.

11.0 VISUAL AND AESTHETIC RESOURCES

This section provides an assessment of potential construction-related impacts to the underground and underwater portions of the Facility. An analysis of the visual and aesthetic resources in the area of the proposed route was provided in the Attachment C of the Supplement (Joint Proposal Exhibit 29). This report was amended in June 2011 to include the proposed aboveground HVDC converter station located in Astoria in the borough of Queens in New York City, New York (Joint Proposal Exhibit 110).

11.1 Facility Description

The Facility includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within Lake Champlain, the Hudson River, Harlem River and the East River. The majority of the terrestrial portions of the Facility are buried in railroad and roadway rights-of-way and are as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the Hudson River from Coeymans; New York, to Cementon, New York; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass; (6) the Luyster Creek converter station area in Astoria; and (7) the approximately three mile 345-kV cable from Luyster Creek converter station to Rainey substation. This innovative approach will avoid and/or minimize the visual and landscape impacts associated with traditional overhead transmission lines, while simultaneously providing the additional capacity required to meet the increasing clean energy demands of the greater New York City metropolitan area.

From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority ("NYPA"). At this point, it has not been determined if these connections will be overhead or underground, due to the need to survey existing utility structures and facilities in this area. The Applicants will not be constructing any new facilities at the NYPA substation; therefore, a visual assessment for this proposed Facility has not been provided.

11.2 Visual Resources

An inventory of visual resources of state, national and local interest was undertaken to identify where proposed facilities would potentially affect visual character or landscape features. This inventory was, at a minimum, consistent with the NYSDEC Program Policy of July 31, 2000, entitled "Assessing and Mitigating Visual Impacts." No resources were identified within 0.25 miles of the proposed converter station site. Due to the predominantly underground location of the Facility within existing transportation corridors, and the location of the converter site at the site of major utility infrastructure and urban development, the potential for significant visual impacts is limited.

11.3 Temporary Visual Impacts During Construction

Although there will not be permanent significant visual impacts outside of the substation, there will be temporary visual impacts during construction. These construction activities are relevant to the types of views that will be seen along the proposed corridor for a limited amount of time from a few days to a few weeks in a given area. For the most part, the visual impacts will be caused by the large equipment necessary for Facility construction and where required, stormwater and erosion controls such as silt fences, haybales, temporary mulching, etc. that will be present within the designated workspaces. These erosion control measures are temporary and will be removed after restoration efforts are complete. Once cable installation is finished, the impacted areas will be re-seeded and left to revegetate naturally. Depending on the time of year, grasses and herbal vegetation will come back in a matter of months while re-growth of woody vegetation may take several years.

During the underground portion of the cable installation, various large equipment vehicles required for initial tree/brush clearing and trenching operations will be on-site. The excavation adjacent to the existing railroad and Route 22 rights-of-way will be performed using traditional excavation equipment. In some areas such as stream or road crossings, horizontal directional drilling ("HDD") equipment will be present at those locations for up to several days at a time. Given the need to schedule work with the railroad and the overall Facility schedule, it is anticipated that cable installation activities will occur twenty fours hour per day/seven days per week in most areas, with nighttime shutdowns occurring in select sensitive receptor areas. This will require that nighttime lighting be used. Directed lighting will typically be used in residential areas to minimize lighting of areas outside of the workspace. The continual construction schedule will result in equipment operation during all hours of the day and night. Because of the variety of subsurface material that could be encountered, it is difficult to specifically state how long a work crew might remain in a particular area, as the installation procedure is also a staggered event. It is estimated that, once clearing occurs, approximately 1,000 to 1,500 feet of cable could be laid during a work day on average over the length of the Facility.

Vegetation clearing in work areas will be conducted to provide for the safe and proper installation of the Facility. The cleared width within the right-of-way and temporary construction workspace will be kept to the minimum that will allow for spoil storage, staging, assembly of materials, and all other activities required to safely install the Facility. Impacts to trees that provide a buffer to visually sensitive areas will be avoided and/or minimized. Where buffer areas cannot be avoided, a qualified arborist will be consulted before construction in these areas and Tree Protections Zones (TPZ) will be established. The final stage of construction will consist of restoring the transmission cable right-of-way and work areas to their original condition and character as much as possible, compatible with the operation and maintenance of the Facility. In some cases, such as along the route of Amtrak passenger rail service from Schenectady to Whitehall, the removal of debris and detritus will result in some enhancement of foreground views from this corridor.

During aquatic cable installation there will be increased vessel activity along the waterways. Cables will be laid by specialized cable-laying vessels or a specially outfitted laybarge. Depending on the types of sediment encountered, different types of construction equipment and equipment configurations will be visible on the water. While it is intended that the use of conventional underwater trench excavation methods will be used, there will be some locations where conventional dredging will be required or additional protective coverings (such as articulated concrete mats) may be installed. In these locations, barge mounted excavators, clam-shell dredges, or cranes will be used. Additional vessels will be present for on-water refueling of vessel engines, excavators, diesel generators, diesel water pumps, etc.

Because of the size and need to stay on-station for long periods of time, the major cable-laying and/or cable burial vessels will not make daily or frequent movements to ports. Instead, these vessels will be supported by a variety of smaller vessels that will support crew shift changes, bring supplies, re-fuel, and monitor the work. It is estimated that approximately 1 to 3 miles of cable could possibly be laid during a work day via jet plowing and one mile per day for the shear plow installation. Visual impacts for actual installation in a given area could last from a few hours to a day or more, while daily support vessel operations may be present and intermittent along the same watercourse over a longer period.

At the transition of the HVDC underwater cables from water to land such is at the landfall area to the Luyster converter station and the terrestrial by-passes, installation will be accomplished through the use of HDD methodology in order to avoid and/or minimize impacts to the bank and near shore area. The areas where the cable arrives to shore will have extensively more construction equipment and support vessels visible for longer time periods to facilitate HDD operations and cofferdam installation.

Construction activity of the substations will occur within property limits. Various large equipment and component delivery vehicles will be present on-site during construction which is expected to last from approximately 7 to 9 months.

11.3.1 Areas of Visual Significance

While the impacts from construction will be temporary in nature, the Applicants have identified the following areas as being potentially sensitive:

11.3.1.1 Route 22 "Lakes to Locks Passage" Scenic Byway

Route 22 is one of four roadways that make up the "Lakes to Locks Passage" scenic byway. Established in 2002, the Lakes to Locks Passage is part of the New York State Byway program administered by the New York State Department of Transportation. In the same year, the U.S. Secretary of Transportation awarded All-American Road status to the Lakes to Locks Passage under the National Scenic Byways Program of the Federal Highway Administration ("FWHA"). The roughly 230 miles byway parallels the Champlain Canal, Lake Champlain, the Chambly Canal and the Richelieu River, among others, and is also referred to as "the Great Northeast Journey."

The mission of the Lakes to Locks Passage is to:

> *Further the appreciation, recognition, stewardship, and revitalization of the natural, cultural, recreational, and historic assets of communities along the interconnected waterways of the upper Hudson River, Champlain Canal, Lake George, Lake Champlain, Chambly Canal, and Richelieu River.*

The Lakes to Locks Passage Corridor Management Plan identifies eight areas of interest: education, recreation, transportation, economic development, tourism, public places, environment, and waterfronts and waterways. For each interest area, the plan provides objectives that inform more locally oriented action plans.

Based on a review of the objectives contained in the Lakes to Locks Passage Management Plan, the installation and operation of the Facility within the Route 22 ROW does not appear to represent a conflict. The primary impacts are related to the installation phase, when construction activities may interfere with transportation activities (primarily vehicle and bicycle) and the viewshed along the roadway. Slow-moving construction vessels will be present within the view corridors of Lake Champlain as Facility installation progresses. Their presence will be transient and temporary. After the installation stage is complete, the only long-term impact would be the removal of vegetation and this could potentially increase the viewscape from this scenic by-way. The Executive Director of Lakes to Locks Passage Inc. indicated via email that, after speaking with the supervisors of the communities of Putnam and Dresden, her organization had no concerns regarding the routing option along Route 22 at that time. However, the Applicants will avoid and/or minimize impacts to forest cover at the clearing edge and restore landscape plantings as appropriate.

11.3.1.2 Scenic Areas of Statewide Significance

The NYSDOS (1993) has designated six areas within the Hudson River valley as Scenic Areas of Statewide Significance (SASS). The Hudson Valley coastal area is divided into geographic Sub-units based on topography, land use and landscape features. These areas are evaluated according to criteria on a regional table of scenic quality that gives scenic value to patterns of natural landscape, patterns of human development and relationships between the natural and human landscape. Within the SASS designations are clusters of Sub-units that are rated and evaluated individually.

The Facility route does not enter into the Columbia – Greene North SASS, but traverses through a section of SASS Sub-unit CO-3 of the Catskill-Olana SASS from the southern boundary of the Village of Catskill, along the "West Shore Railroad", and then along the western perimeter of the Sub-unit as the railroad is located essentially parallel to NYS Route 9W south of the point where CSX crosses under 9W south of the Village of Catskill, for a total distance of approximately 3.4 miles. The area traversed along the railroad is a mix of land uses including transportation, commercial, and industrial areas.

While there are large areas of forest and farmland throughout this Sub-unit, the area traversed by the "West Shore Railroad" has limited scenic characteristics. Large industrial structures associated with limestone quarrying and cement processing are dominant visual features in the area. The views characterized in the SASS Sub-unit description are generally not applicable to the area traversed by the railroad and Route 9W south of Catskill. As the SASS report indicates, "the subunit is better known as part of the distance in the views from the Olana State Historic Site located in the CO-6 Olana subunit on the east side of the Hudson River" and "importance is also derived from the contribution it makes to the middleground of views from the Olana State Historic Site and National Historic Landmark in the CO-6 Olana Sub-unit on the eastern shore of the Hudson River." Due to its location at the far western periphery of the SASS unit, the railroad corridor along Route 9W does not play an important role in defining the landscape or adding characteristics to the scenic area.

The clearing of vegetation along the CSX railroad ROW will not significantly affect views of the CO-3 Kykiut Sub-unit from the prominent Olana Sub-unit. Views from Olana to the railroad corridor are almost completely screened by topography and vegetation, with one minor exception in the Village of Catskill on the hill south of the Catskill Creek rail bridge. The vista from Olana toward the west and southwest extends from the Hudson River and Rip Van Winkle Bridge in the fore-ground, over the forested slopes, roofs and spires within the Village of Catskill in the middle-ground distance, to the far background setting which encompasses the northern extent of the Eastern Escarpment of the Catskill Mountains (see Figure 11-1). The minor degree of vegetation clearing at a distance of approximately two miles from the western veranda at the Olana mansion will be insignificant, and fully within the character of the existing westerly view. Views easterly from the CSX rail corridor and NYS Rt. 9W at the western limits of CO-3 Sub-unit are not unique, as depicted in attached Figure 11-2 and 11-3.

The Facility will be located within the Hudson River as it traverses the Ulster North, Estates District, Esopus and Hudson Highland SASS regions. The Facility enters the Hudson River at Cementon, within the Town of Catskill, to the north of the Ulster North SASS (Sub-unit UN-1) and visible to the Estates District SASS (Sub-unit ED-1). The location selected for the Facility to re-enter the Hudson River at Cementon is an industrial landscape dominated by large-scale cement processing and handling structures and equipment, and areas of industrial landfill as evidenced by grassy dome-like slope features. The landfall is at a bulkheaded shoreline location between two prominent cement processing facilities. The landfall location will be marked with a large cable warning sign which is intended to provide a safety notice to Hudson River vessels regarding the presence of buried high-voltage electric cables. The specific signage has not been selected, but it will conform to ANSI Z535.1 through .6 and typical examples are provided in Figure 11-4. This type of sign will have limited visibility from the SASS area Sub-units located within the river and on the easterly shore and banks**.** Attached Figures 11-5 and 11-6 provide views to the Cementon area landscape including the landfall, from publicly accessible shoreline locations at Germantown and Cheviot. There will also be slow-moving construction vessels associated with the Facility installation within the Sub-unit views to the River. The presence of these vessels will be transient and temporary and are typical of other commercial traffic on the Hudson River. The ephemeral nature of the construction vessels and activity could add interest for some viewers of the Hudson River landscape, particularly from areas of the working waterfront. The Facility is not anticipated to diminish or alter the attributes of any SASS Sub-unit.

11.4 Luyster Creek Converter Station

On May 19, 2011, a site visit was made to interpret the potential visual layout of the Luyster Creek Converter Station site and to obtain photographs for visual simulations. A final report was completed in June of 2011 and provided as Exhibit 110 to the Joint Proposal. The results of this study are provided below.

11.4.1 Visual Setting

The land use in the vicinity of the proposed converter station in Astoria, NY is largely transportation and utilities in a highly urban industrial zoned area owned mainly by Consolidated Edison Company of New York, Inc. (Con Edison). The proposed site for Astoria converter station is within the larger Con Edison complex, northwest of Luyster Creek. The East River lies to the east and north of the Con Edison Property. The nearest main public thoroughfare is 20th Avenue running northwest-southeast and forming the southwestern boundary of Con Edison Property. Residential areas lie outward from 20th Avenue toward the southwest perimeter of the study area. The viewscape in the immediate vicinity of the converter station site is comprised of industrial complexes that include generating facilities, oil storage tanks, large parking lots, and electric switchyards (Figure 11-7). A soccer field and baseball diamond located within Con Edison property lies southwest of the proposed site location.

A photo log was collected during a site visit on May 19, 2011 showing views toward the site from various locations along the periphery of the proposed Facility. Access to vantage points within Con Edison property is restricted and several groupings of trees and buildings are located to the south of the proposed converter station location. As a result of the restricted access, there are few locations that could be photographed showing the representative size and scale of the Facility in the context of its potential surroundings. The vantage points and respective photographs obtained along 20th Avenue were entered into the 3-dimensional software and the model results indicated that there would be few views of the Facility due to buildings and several groups of trees located west and south of the site.

Although not an area that would have significant public access, one location at the end of 19th Avenue, approximately 800 feet from the proposed converter station location, had the best open view of the site and was subsequently used for the photosimulation. The existing conditions photo shows that, from the closest location for public access, a high voltage transmission line and industrial building are currently visible around the proposed site. The photosimulation

(Figure 11-8) shows that the Facility will partially be obscured by the trees while the eastern third of the enclosed building housing DC and valve areas will be visible. A small portion of the transformers and cooling valves will be visible as well as two of three lightning masts. Since the immediate environment is that of heavy industrial land use, the proposed Facility will not be out of character with existing scenic views and will not alter the views. No new types of visual elements will be introduced into the landscape beyond what already exists in the area.

11.5 Avoidance and/or Minimization of Potential Visual Impacts

The Facility has been sited and designed so that there will be no significant permanent impacts on visual and aesthetic resources. The transmission cables will be installed underwater in existing waterways, buried along existing railroad, utility or roadway rights-of-way, or installed via trenchless technology. This design will minimize the visual and landscape impacts associated with overhead transmission lines or conventional underground facilities sited on new ROW.

Tree clearing for Facility construction may result in changes to local views. Adverse impacts at locations due to clearing at areas with identified public interest (including parks, heritage resource sites, and residential areas) will be avoided and/or minimized by implementing tree protection measures and appropriate arboricultural standards, and use of landscape planting in select locations.

The only permanent above-ground facilities associated with the Facility will be line markers, warning signs at navigable waterways, and the converter station. Line markers will not be obtrusive within existing corridors. Warning signs at the banks of navigable waterway will be located where visual contrasts are minimized by existing shoreline development and where visual sensitivity is low. The setting of the proposed converter station is dominated by existing utility infrastructure, and the immediate environment surrounding the location is mostly industrial and commercial land use so the converter station will not be out of character with existing views and will not redefine the nature of the landscape. Views toward the site from nearby residential areas are dominated by the expanse of existing utility infrastructure and a small cluster of trees.

12.0 NOISE

This section describes the applicable noise standards, the construction activities, and the operation of the Transmission System that may result in elevated noise levels and the anticipated potential impacts as well as appropriate avoidance and/or minimization strategies. A detailed analysis that includes the measured existing noise levels in areas of potential noise impacts, the modeled noise impacts associated with operation of the proposed Luyster Creek converter station, and the demonstration of compliance with operational noise regulations and standards has been completed (Joint Proposal Exhibit 107).

12.1 Facility Description

The Facility includes a 1,000 MW High Voltage Direct Current ("HVDC") transmission circuit originating at the Canadian border and extending approximately 332 miles to New York City. The HVDC cables will be buried within and/or installed under Lake Champlain and the Hudson Harlem and East Rivers. The majority of the terrestrial portions of the route are buried in railroad and roadway rights-of-way generally as follows: (1) the approximately 10.8-mile bypass of lower Lake Champlain; (2) the approximate 86.6-mile bypass of the Upper Hudson River PCB Dredging Project; (3) the approximately 29.2-mile bypass of the upper Lower Hudson River; (4) the approximately 7.7-mile bypass of Haverstraw Bay; (5) the approximately 1.1-mile bypass of the East River via the Hell Gate Bypass and (6) the Luyster Creek converter station area in Astoria. From the converter station, two 345 kV HVAC circuits will connect to a gas insulated switchgear substation owned or to be owned by the New York Power Authority ("NYPA") and an approximately three mile 345-kV cable will be installed from the Astoria Substation to Rainey Substation. The Applicants will not be constructing any new facilities at the NYPA substation; therefore, a noise assessment for this proposed Facility has not been provided.

12.2 Existing Noise Standards

Sound is caused by differences in pressure that are detected by the ear. The magnitude of sound pressure is usually expressed in decibels (dB). Noise is generally defined as unwanted sound. Sound levels are typically measured and expressed as an A-weighed sound level (dBA). The A-weighting scale was developed to mimic the response of the human ear to sounds. Noise impacts can be determined for a particular noise-sensitive receptor, such as a residence, school or other building, by comparison to the background sound levels in the existing noise environment at that location.

Noise is regulated primarily through local zoning regulations which differ from community to community. These regulations usually address maximum noise levels allowed at adjacent property lines during different times of day for different planning zones. During the operational period, the Applicants will comply with the applicable noise requirements except during periods of emergency cable repair/servicing, which are expected to occur extremely infrequently, if at all. Such emergency periods will also be kept as short as possible in duration so as to avoid and/or minimize impacts to nearby properties and minimize transmission downtime.

Federal standards and guidelines include the United States Occupational Health and Safety Administration's (OSHA) regulations that describe limits for noise exposure to protect worker health and safety, and the USEPA's Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (USEPA 1978).

12.2.1 New York State Guidelines

The NYSDEC has issued a program guidance document entitled *Assessing and Mitigating Noise Impacts* (NYSDEC 2000). This guidance, which is premised on state statutory authority, has been utilized as a standard for evaluating potential noise impacts from numerous projects throughout New York. The guidance recommends that, to avoid impacts, the A-weighted Sound Pressure Level (SPL) should not exceed ambient noise levels by more than 6 dBA at noise-sensitive receptors, and the addition of any noise source in a non-industrial setting should not raise the total future ambient noise level above a maximum of 65 dBA. Noise levels in industrial or commercial areas should not exceed 79 dBA.

Although the 6 dBA increase is to be used as a general guideline, the NYSDEC guidance states that other factors should also be considered. For example, in settings with very low ambient sound levels, a greater increase in sound may be acceptable.

12.2.2 New York City Noise Code

The New York City Noise Code (See New York City Noise Code § 24-232) was revised in December 2005 and went into effect in July 2007. Under the New York City Noise Code, construction activity is limited to weekdays between 7 a.m. and 6 p.m. The code also contains sound level standards for various sources of ambient noise and construction noise, and prohibits unnecessary noise near hospitals, schools, and courthouses.

The sound level standards limit noise levels as they would be measured in the interior of buildings, not outdoors. The applicable limits for the interior of residential structures are provided below.

NYC Noise Code - Maximum Noise Level (dB) Inside Receiving Room									
Building Type	**Octave Band Frequency (Hz)**								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Mixed-use & Residential	70	61	53	46	40	36	34	33	32

12.2.3 New York City Zoning Resolution

Section 42-21 of the New York City Zoning Resolution sets maximum permissible noise levels from any on-site activity according to octave band (see New York City Zoning Resolution § 42-21 (1999)). Noise is defined as the sound pressure level (SPL) resulting from any open or enclosed activity. The converter station site is located in a Heavy Manufacturing District (M3-1). The decibel level limits which may not be exceeded at any point on any lot line, according to land use, are presented below. Note that the standard presents octave band ranges which are now obsolete. The current octave band center frequencies corresponding to the ranges are provided.

NYC Zoning Resolution Noise Standard (dB)			
Octave Band Range (Hz)(Obsolete)	**Octave Band Center Frequency (Hz)**	**Limits for M-3 District**	**Limits for M-3 District Adjoining a Residential District**
20 to 75	63	80	74
75 to 150	125	75	69
150 to 300	250	70	64
300 to 600	500	64	58
600 to 1,200	1000	58	52
1,200 to 2,400	2000	53	47
2,400 to 4,800	4000	49	43
Above 4,800	8000	46	40
Source: New York City, City Planning Commission and City Planning Department (1998, Sections 42-213 and 42-214).			

12.3 Luyster Creek Converter Station

The proposed Astoria HVDC converter station will contain four 400 MVA transformers, three of which will operate at any given time, with the fourth available as a backup. Forty-four valve coolers (11 banks of four) are part of the design, as well as multiple equipment noise sources located within a building to be constructed on site. Noise level data for the proposed sources and physical dimensions of the equipment were obtained from the vendor ABB. Table 12-1 identifies each piece of noise generating equipment along with its estimated sound power level, as supplied by a manufacturer.

12.3.1 Existing Conditions

The area in the vicinity of the proposed Luyster Creek converter station includes industrial, commercial, and residential land uses. The existing noise environment for the site was characterized through an ambient noise monitoring program that consisted of short-term monitoring at nearby residential locations over the period from May 25 to May 26, 2011. The three locations selected were the intersection of 20th Avenue with 27th Street, 31st Street, and 37th Street.

Meteorological conditions during the noise monitoring program included temperatures that ranged from 81º F during the day to 65º F at night, and mostly clear skies. Winds were calm to light, with no strong gusts. No precipitation occurred.

Short-term monitoring (15 minutes in duration at each location) was conducted during the day and repeated late at night. Nighttime monitoring was conducted from about 1:00 a.m. through 2:30 a.m. in order to collect data during hours when there was less activity and traffic. Monitoring was conducted with a RION NA-27 precision Type 1 octave band analyzer. The microphone was fitted with a windscreen to reduce wind generated noise and mounted on a tripod at a height of approximately five feet above the ground. The instrument was configured to measure and store the L_{eq} one-third octave band levels.

A summary of the overall A-weighted L_{eq} short-term data collected during noise monitoring is presented in Table 12-2. Measured nighttime L_{eq} levels were 47.7 dBA to 52.6 dBA.

12.3.2 Future Noise Levels

Computer modeling was employed to estimate noise levels that would be experienced at nearby residential and industrial areas due to operation of the proposed converter station. The commercially available CadnaA model developed by DataKustik GmBH was used for this analysis. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, and reflections from surfaces. The software is standards-based and the ISO 9613 standard was used for air absorption and other noise propagation calculations (ISO, 1993). The analysis factored in existing topographic features of the converter station site and surrounding area and their reflection or barrier effects. No credit was taken for the shielding effects of existing buildings.

The outdoor sources were built into the CadnaA model utilizing the sound power data as provided. For the interior converter station building sources, the Applicants calculated the sound level expected inside the building (accounting for reflections that will occur) and included a nominal 15 dBA transmission loss value for the building walls. This transmission loss value is very conservative and is typical of thin sheet metal walls.

Figure 12-1 provides a noise contour map that depicts the estimated Astoria HVDC converter station noise levels throughout the area surrounding the site.

12.3.2.1 NYC Zoning Resolution - Industrial Property Lines

Estimated converter station noise levels are compared to the New York City Zoning Resolution noise standard for the M3 zone industrial property line in Table 12-3. The data demonstrate that estimated converter station noise levels would be in compliance with the New York City Zoning Law's noise standard for the M3 zone industrial property line locations.

12.3.2.2 NYC Zoning Resolution – Residential Property Lines

Estimated total converter station noise levels at the nearest residential receptors are compared to the New York City Zoning Resolution for residential property lines in Table 12-4. The data demonstrate that estimated converter station noise levels would be in compliance with the New York City Zoning Law's exterior standard for residential uses bordering an M3 industrial zone.

12.3.2.3 NYC Noise Code

As discussed previously, the NYC Noise Code places limitations on noise levels as measured at interior residential locations. According to the NYC CEQR manual, "typical construction techniques used in the past (including typical single-glazed windows) provide a minimum of approximately 20 dB(A) of noise attenuation, from outdoor to indoor areas" (CEQR Manual, 410, Impact Thresholds at Receptors). Notwithstanding that the residential apartment buildings in the vicinity of the converter station are of masonry construction and are thus expected to provide greater attenuation, the minimum noise attenuation was conservatively applied to the converter station noise level calculations in order to estimate the sound levels at the interiors of residences closest to the converter station. An octave band curve based on a 20 dBA transmission loss value was developed, conservatively utilizing the transmission loss values for materials used in standard residential construction (wood frame buildings).

Table 12-5 provides a summary of the estimated associated noise levels, the 20 dBA transmission loss values, calculated interior noise levels and a comparison to the NYC Noise Code. The data demonstrate that converter station noise levels would be in compliance with the interior NYC Noise Code standard at all residential receptors near the site.

12.3.2.4 NYSDEC Noise Policy

As previously discussed, the NYSDEC guidance considers a six dBA or greater increase over existing ambient noise levels to be significant in most cases. Projected noise levels will not result in a significant noise as defined by the NYSDEC policy.

12.3.3 Pure Tone Analysis

A pure tone analysis was conducted to determine the potential for emanation of pure tones from the converter station. Pure tone noises are defined under USEPA's Model Community Noise Control Ordinance as "sounds which can be distinctly heard as a single pitch or set of pitches." A pure tone is considered to exist if the one-third octave band sound pressure in the band with the tone exceeds the level of both adjacent bands and the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by the following:

- 5 dB for center frequencies of 500 Hz and above,
- 8 dB for center frequencies between 160 Hz and 400 Hz, and
- 15 dB for center frequencies less than or equal to 125 Hz.

The transformers and valve coolers, which comprise the converter station's major outdoor equipment sources, were evaluated for the pure tone analysis. Detailed one-third octave band data for the transformers and coolers were not available from potential vendors. As such, typical spectral data for each of these sources was obtained from available literature (Harris, 1991). The spectral data were input to a spreadsheet in order to calculate whether pure tone conditions would occur from equipment operation. Tables 12-6 and 12-7 show the pure tone calculations for the transformers and coolers, respectively. The data indicate that there will be no pure tone noises associated with operation of the converter station. The data indicate that pure tone noises associated with operation of the converter station are not anticipated. Upon final selection of transformer equipment, the Certificate Holders will review operational characteristics reported by the equipment manufacturer, and address potential operational noise in final converter station design and mitigation measures. Post-construction measurement of operational noise will be completed to represent average and maximum operational conditions.

12.3.4 Potential Noise Impacts to Historic Sites

As previously discussed, the estimated converter station noise levels will be below existing standards. Therefore, noise during the daytime when visitors might be present will be at acceptable levels.

12.4 Potential Impacts

12.4.1 Construction Activities

Although there will not be permanent noise impacts outside of the substation, it is anticipated that there will be temporary noise impacts during construction primarily due to large equipment necessary for construction. During the underground portion of the cable installation, various large equipment vehicles required for initial tree/brush clearing and trenching operations will be on-site. The trench excavation will be performed using rail mounted equipment or traditional excavation equipment. In some areas such as stream or road crossings, horizontal directional drilling (HDD) equipment will be present at those locations for up to several days at a time. A listing of typical ranges of equipment sound levels from the construction equipment associated with each construction phase at a standard distance of fifty (50) feet and a distance of four hundred (400) feet is provided below.

Construction Phase Noise Levels of the Transmission Line

Construction Phase	Construction Equipment Noise Levels (dBA)	
	50 Feet	400 Feet
Site Clearing and Preparation	60 to 90	42 to 72
Trenching	60 to 90	42 to 72
Cable Laying	50 to 90	32 to 72
Backfilling	73 to 84	35 to 66
Cable Pulling/Splicing	50 to 80	32 to 62

Source: Ebasco Environmental –Sound Cable Project (1987).

Site clearing includes the use of industrial mowers and chain saws as needed. Removal of vegetation will be insignificant and will not affect noise propagation offsite. As presented above, maximum noise levels associated with the construction equipment are anticipated to not exceed ninety (90) decibels (dBA) at a distance of fifty (50) feet for people who are outdoors. A building will provide significant attenuation of associated construction noise impacts. For instance, sound levels can be expected to be up to twenty seven (27) dBA lower indoors with windows closed. Even in homes with windows open, indoor sound levels can be reduced by up to seventeen (17) dBA (USEPA 1978).

Given the need to schedule work with the railroads and the overall construction schedule, it is anticipated that cable installation activities will occur twenty fours hour per day/seven days per week in most areas. Because of the variety of subsurface material that could be encountered, it is difficult to specifically state how long a work crew might remain in a particular area as the installation procedure is also a staggered event. It is estimated that once clearing occurs, approximately 1,500 feet of cable could be laid during a single work day along the terrestrial route. Because of the staggered concurrent activities, operations in one area may continue for consecutive days over a period up to two weeks. Along the portion of the route within the City of Schenectady, and along the CNY streets between the Astoria Substation and Rainey Substation, daily production rates will be much lower. In these areas the cable will be installed within ductbanks which provide more protection for the cables and allow construction to take place in shorter sections of open trench. Ductbank construction rates are expected to be approximately 100 feet per day within the city streets. The lower production is due to impacts caused by the different construction installation method, traffic coordination, existing utilities and other factors. Once the duct banks are constructed the trench can be backfilled and the pavement replaced. The cable can be pulled into the ducts any time after the duct has been constructed.

Based on the available information, it is anticipated that construction of the transmission line in the vicinity of any single residence or business will last only a few days to a week as construction progresses along the transmission cable construction zone. Residents and businesses could be temporarily impacted by noise from construction activities associated with the installation of the land portions of the cables and the converter station. Installation of the cables and converter station will likely be conducted in compliance with all local zoning ordinances, except where specific waivers from these ordinances are requested. However, given the need for certain installation activities to occur uninterrupted (e.g., HDDs), noncompliance with construction related noise requirements may occur. See Exhibit 7 (Local Ordinances) of the Application (Joint Proposal Exhibit 7), Attachment I of the Supplement (Joint Proposal Exhibit 35), and Joint Proposal Exhibit 115 for waiver requests from local laws regulating construction related noise levels. The Applicants will continue to evaluate the need for noise avoidance and/or minimization measures based on ongoing consultations with agency and stakeholder groups.

During aquatic cable installation there will be increased vessel activity along waterways. Cables will be laid by specialized cable-laying vessels or a specially outfitted laybarge. Depending on the types of sediment encountered, different types of construction equipment and setups will be visible on the water. While it is intended that the use of conventional underwater trench excavation methods will be used, there will be some locations where conventional dredging will be required or additional protective coverings (such as articulated concrete mats) may be installed. In these locations, barge mounted excavators, clam-shell dredges, or cranes will be used. Additional vessels will be present for on-water refueling of vessel engines, excavators, diesel generators, diesel water pumps, etc.

Underwater noise from the operation of vessels and installation of cables has the potential to create temporary and localized impacts on aquatic organisms. However, underwater construction methods producing very high dB levels, such as pile driving or blasting, are not anticipated. Sheetpile driving for cofferdam installation will likely involve pneumatic or vibratory methods. Therefore, it is expected that noise levels will be below those levels that could cause temporary impacts to fish and wildlife. Because the water jetting installation will produce a fairly constant noise, fish and other aquatic species may move into adjacent areas. The Applicants have consulted with resource agencies to limit in-water installation work to certain periods of the year, which should further avoid and/or minimize the impact of certain noise producing activities.

Because of the size and need to stay on-station for long periods of time, the major cable-laying and/or cable burial vessels will not make daily or frequent movements to ports. Instead, these vessels will be supported by a variety of smaller vessels that will support crew shift changes, bring supplies, re-fuel, and monitor the work. It is estimated that approximately 1 to 3 miles of cable could possibly be laid during a work day. Noise impacts for actual installation in a given area could last from a few hours to a day or more, while daily support vessel operations may be present and intermittent along the same watercourse over a longer period.

At the transition of the HVDC underwater cables from water to land such as to the landfall area to the Luyster Creek converter station will be accomplished through the use of HDD methodology in order to avoid and/or minimize disturbance to the bank and near shore area. The areas where the cable arrives to shore will have extensively more construction equipment and support vessels present for longer time periods to facilitate HDD operations and cofferdam installation.

Construction activity related to the substation will occur within the property limits. The site preparation will require approximately six to eight months. Various large equipment and component delivery vehicles will be present on-site during construction which is expected to last approximately 7 to 9 months.

12.4.2 Luyster Creek Converter Station

The estimated noise levels for the Luyster Creek converter station indicate that the Facility would be in compliance with the state and local standards discussed herein.

12.5 Avoidance and/or Minimization Measures

Sensitive receptors along the route will be identified prior to cable installation construction. The receptors will be identified through a review of aerial photography and during the detailed EM&CP walk over and appropriate actions to avoid and/or minimize noise will be developed. A noise avoidance and/or minimization plan will be developed specifically for the construction of the converter station that will include: hours of construction, materials handling and construction related activities, use of low noise equipment (transformers, fans and etc.) and Facility design.

Noise control measures for cable construction may include the following:

a) Locating equipment yards and marshalling areas away from noise-sensitive receptors as practical;

b) Installing improved mufflers on heavy construction equipment when used in close proximity to noise sensitive areas;

c) Utilizing low-noise technologies (e.g., vibratory pile drivers) as appropriate;

d) Limiting construction of high noise level activities (e.g., wood chipping, pile driving) to non-overnight hours as much as possible when construction is conducted in close proximity to noise-sensitive receptors;

e) Limiting use of point sources e.g., HDD or other activities that remain in a single location for an extended period of time) and

f) In extreme cases, install temporary sound barriers to reduce noise levels or ceasing activities during the nighttime hours.

Specific noise control measures are not anticipated for the converter station's operational phase. The proposed converter station building itself is a noise control measure that will act to both reduce noise from sources inside the building, and will act as an effective barrier of Facility sources (e.g., cooling fans and transformers) to offsite noise sensitive areas. No other noise control measures are anticipated to be required in order to demonstrate compliance with all applicable noise standards and guidelines.

13.0 PUBLIC HEALTH

This section assesses the electromagnetic field (EMF) associated with the operation of high voltage electric transmission cables. Report analyzing the potential public health EMF impacts for underwater and underground HVDC transmission cables have been provided in Appendix H of the Application (Joint Proposal Exhibit 22), Attachment M of the Supplement (Joint Proposal Exhibit 39), a report to the NYSDOS (Joint Proposal Exhibit 100), and a report to the settlement parties (Exhibit 116). A report to the settlement parties on the EMF impacts for underground 345 kV HVAC cables was also developed (Joint Proposal Exhibit 119)..

The Applicants intend to connect renewable sources of power generation in Canada to load centers in New York City. The HVDC transmission cables will include two underwater and underground cables routed along existing waterways from a HVDC converter station in Canada to another converter station in Astoria, Queens, New York City. The HVDC cables, approximately three hundred thirty two (332) miles long, comprise a bipole, which will utilize the second cable as the metallic return. There will also be a short (<0.5 mile) segment of HVAC cables connecting the converter station to a nearby substation at Astoria and a three (3)-mile segment of HVAC cables connecting the Astoria Substation to the Rainey Substation.

13.1 Electric and Magnetic Field Overview

Electric power systems produce EMF which consists of two components -- electric fields and magnetic fields. An EMF is a physical field produced by electrically charged objects. It affects the behavior of charged objects in the vicinity of the field. Most objects are electrically neutral because positive and negative charges are present in equal numbers. When the balance of electric charges is altered, electrical effects occur, such as the static-electricity. Electrical effects occur both in nature and because of society's use of electric power.

Although it is common to consider electric and magnetic fields together and call them electromagnetic fields ("EMF") it is important to understand that in the power frequency range, they are two separate entities that have unique properties and interactions and behave differently. Electric fields are produced by voltage and are easily shielded or weakened by conducting objects like trees and buildings. Magnetic fields are produced by current and are not easily shielded or weakened by most materials. Both electric and magnetic fields are reduced in strength by increasing the distance from the source.

13.1.1 Electric Fields

Alternating current on any wire, whether an overhead phase conductor or lamp cords, produces electric fields in the area surrounding the wire. Electric fields are invisible lines of force that repel or attract electrical charges. As with a magnet, if the charges are the same (i.e., either both positive and both negative), the charges repel each other. If the charges are different (i.e., one negative and one positive), there will be an attractive force between them.

Electric fields are proportional to the operating voltage of the transmission line. The line voltage is controlled within a small range (usually ± 10 percent) and, hence, little variation is expected in the electric field levels.

Obstructions such as row of trees, a building, or earthen material will act to shield or block electric fields. <u>Since the transmission cables will be shielded and/or buried, the magnitudes of the electric field levels are assumed to be inconsequential or zero and are not further presented.</u>

13.1.2 Magnetic Fields

Any object with an electric charge has a voltage (potential) at its surface and can create an electric field. When electrical charges move together (an electric current) they create a magnetic field, which can exert force on other electric currents. All currents create magnetic fields. Magnetic fields occur throughout nature and are one of the basic forces of nature. The strength of the magnetic field depends on the current (higher currents create higher magnetic fields), the configuration/size of the source, spacing between conductors, and distance (magnetic fields grow weaker as the distance from the source increases).

Magnetic fields can be static, i.e., unchanging in direction (caused by direct current [DC]) or changing in direction (caused by alternating current [AC]). Some electrical devices operate on a DC system while others operate on an AC system. The magnetic field from AC sources (such as typical overhead electrical transmission lines) differ from DC fields (like the Earth) because the field is due to ACs and changes direction at a rate of 60 cycles per second or 60 Hz in the United States and certain other countries.

The characteristics of magnetic fields can differ depending on the field source. A magnetic field near an appliance decreases rapidly with distance away from the device. The magnetic field also decreases with distance away from line sources, such as power lines. Electric transmission line magnetic fields attenuate at a rate that is inversely proportional to the distance squared, whereas magnetic fields from appliances attenuate at a rate proportional to the distance cubed. For electric transmission lines, magnetic and electric field levels are highest next to the transmission lines (typically near the center of the electric transmission line right-of-way) and decrease as the distance from the transmission right-of-way or corridor increases.

Measured magnetic field strengths can be compared to the magnetic fields typically associated with existing transmission line rights-of-way and those typically associated with various electric devices and phenomena. The Earth's DC magnetic field over the United States range from 40 to 590 mG. Typical magnetic field levels produced by AC currents at distances of one foot and two feet from some common household appliances are shown on below.

Magnetic Field Levels of Various Household Appliances

Appliance	Magnetic Field at 1 foot (mG)	Magnetic Field at 2 feet (mG)
Hair dryer	Bg-70	Bg-10
Window A/C	Bg-20	Bg-6
Color TV	Bg-20	Bg-8
Dishwasher	6-30	2-7
Refrigerator	Bg-20	Bg-10
Can opener	40-300	3-30
Microwave	1-200	1-30
Washing machine	1-30	Bg-6
Power drill	20-40	3-6

13.2 Electric and Magnetic Field Standards

13.2.1 Federal

Review of electric and magnetic field standards did not identify any Federal standards regarding limiting residential or occupational exposure to DC or low frequency (60 Hz) magnetic or electric fields.

13.2.2 Electric Field Standards

The applicable electric field strength standards established by the NYSPSC are set forth in PSC Opinion 78-13, dated June 19, 1978. The opinion established an electric field strength interim standard of 1.6 kilovolts per meter (kV/m) for electric transmission lines, at the edge of the right-of-way, one meter above ground level, with the line at the rated voltage.

13.2.3 Magnetic Field Standards

The magnetic field standards established by the NYSPSC are set forth in the *Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities*, issued and effective September 11, 1990. The interim policy established a magnetic field strength interim standard of 200 milligauss (mG), measured at one meter above grade, at the edge of the right-of-way, at the point of lowest conductor sag. The measurement is based on the expected circuit currents being equal to the winter-normal conductor rating.

13.3 Magnetic Field Calculations

A computer model, C3CORONA, Version 3, the corona and field effects software program developed by the Bonneville Power Administration and the USDOE, was used to calculate magnetic fields at three locations associated with the HVDC cable system. The three locations studied are: (a) above Lake Champlain; (b) adjacent to the Canadian Pacific (CP) Railroad; and (c) above the Hudson River. The assumptions with regards to the physical spacing of the cables are shown below, although the configuration of the cables in terms of in-water burial and cable spacing have since been modified through further consultation with agencies and stakeholders.

Assumed Factors Affecting Physical Location of HVDC Cables

Location	Depth of Water	Depth of Trench	Horizontal Separation between the Two Cables
Lake Champlain	400 feet	3 feet	6 feet
CP Railroad	--	3 feet	3 feet
Hudson River	32 feet	3 feet	6 feet

The calculated magnetic field levels at each of the three (3) locations are summarized below. The levels are shown at five (5) foot increments along the one hundred (100) foot profile centered on the cable configuration from a point negative fifty feet (-50) east of the cables to a point positive fifty feet (+50) feet west of the cables.

Calculated Magnetic Field Levels for HVDC Cables

Horizontal Coordinate (feet)	Configuration / Location		
	Above Lake Champlain (milligauss)	CP Railroad (milligauss)	Above Hudson River (milligauss)
-50	0.4	13.0	16.6
-45	0.4	15.9	18.8
-40	0.4	20.1	21.5
-35	0.4	26.0	24.4
-30	0.4	35.1	27.8
-25	0.4	49.6	31.4
-20	0.4	75.1	35.1
-15	0.4	125.1	38.7
-12.5	0.4	169.1	40.4
-10	0.4	237.4	41.8
-5	0.4	505.9	43.9
0	0.4	788.6	44.6
+5	0.4	505.9	43.9
+10	0.4	237.4	41.8
+12.5	0.4	169.1	40.4
+15	0.4	125.1	38.7
+20	0.4	75.1	35.1
+25	0.4	49.6	31.4
+30	0.4	35.1	27.8
+35	0.4	26.0	24.4
+40	0.4	20.1	21.5
+45	0.4	15.9	18.8
+50	0.4	13.0	16.6

The Applicants also retained Exponent Inc. to provide an estimate of magnetic field level increases associated with in-water installation of the cables to a planned depth of six feet (see Attachment C; Joint Proposal Exhibit 100). At nineteen (19) feet above the riverbed, the maximum magnetic field variation was 4.3 mG when the cables were in a vertical position and 6.5 mG when the cables were in a horizontal position.

The magnetic field levels for the Astoria-Rainey cable were calculated using the ENVIRO software program (Joint Proposal Exhibit 119). ENVIRO is one of several EMF related software programs that are part of the EMF Workstation (Version 2.51) developed by Enertech Consultants for the Electric Power Research Institute (EPRI). The calculated magnetic field levels directly over the HVAC cables and a distance either side of the UG circuit centerline for both the XLPE and HPFF cable systems are summarized in Table 1 below. Burial depth of both cable systems is essentially the same: 4.86 feet for the XLPE system and 4.88 feet for the HPFF (Pipe-Type) system.

Calculated Magnetic Fields for Astoria-Rainey Cables

Feet from circuit centerline	Magnetic Field for XLPE Milligauss	Magnetic Field for HPFF Milligauss
-50	4.58	3.36
-40	7.07	5.18
-30	12.22	8.94
-20	25.43	18.54
-10	71.98	52.20
-5	132.04	95.49
OVER CABLES	181.59	131.84
+5	129.79	95.49
+10	70.52	52.20
+20	25.04	18.54
+30	12.,08	8.94
+40	7.01	5.18
+50	4.55	3.36

13.4 Avoidance and/or Minimization of Potential Impacts

Applicable New York State magnetic and electric field standards are summarized below:

- The maximum magnetic field at the edge of a right-of-way for a major overhead transmission line is 200 mG, as set forth in the NYSPSC's *Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities*, issued and effective September 11, 1990 ("Interim Policy Statement"). The Interim Policy Statement established a magnetic field strength interim standard of 200 milligauss (mG), measured at one meter above grade, at the edge of the right-of-way, at the point of lowest conductor sag. Although the NYSPSC developed the Interim Policy Statement in the context of 60 Hz AC transmission lines and did not directly address the issue of DC magnetic fields, it has also used this standard in approving several HVDC projects.
- The maximum electric field at the edge of a right-of-way for a major transmission line is 1.6 kV/m, as set forth in PSC Opinion 78-13, dated June 19, 1978. The opinion established an electric field strength interim standard of 1.6 kilovolts per meter (kV/m) for electric transmission lines, at the edge of the right-of-way, one meter above ground level, with the line at the rated voltage.

The HVDC and HVAC cables will satisfy the requirements of PSC Opinion 78-13, as the cables will be buried in the ground or installed primarily in a trench at the bottom of waterways. Electric fields are therefore reduced to inconsequential levels.

Model run results indicated that the HVDC cables**,** as described above, will satisfy the requirements described in the *Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities.* This is demonstrated by the fact that all field levels at the edge of the

ROW (defined as within 12.5 of the centerline for the overland portion of the route) will be less than 200 mG. Modeling also showed that the maximum magnetic field deviation would be 6.5 mG at nineteen feet above the cables when they are buried six (6) feet into the riverbed.

Moreover, it should be noted that recommended exposure limits for DC magnetic fields are an order of magnitude higher than for AC magnetic field. In fact, the International Commission on Non-ionizing Radiation Protection has recommended that exposure limits for static magnetic fields be set at 4,000,000 mG for the general public and 20,000,000 mG for workers[11]. Both standards are considered ceiling values and include no limit on the duration of exposure if the intensity of exposure is below the specified limits.

Thus, the 200 mG DC magnetic field that would be created by the HVDC cables poses a far lower threat to human health than an AC field of similar strength. Because the fundamental objective of the Interim Policy Statement was “prudent avoidance” of 60 Hz fields, as advocated in a 1989 background paper,[12] the NYSPSC should take this difference into account in evaluating the Facility.

Model run results also show that HVAC cables will satisfy the requirements described in the *Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities.* The magnetic field strength for both the XLPE cable system and for the HPFF (pipe-type) system is less than 200 mG.

[11] Health Physics, 2009. Guidelines on Limits of Exposure to Static Magnetic Fields. 96(4):504-514; 2009.
[12] U.S. Congress, Office of Technology Assessment, 1989. Biological Effects of Power Frequency Electric and Magnetic Fields-Background Paper, OTA-BP-E-53. This paper describes this concept as looking “systematically for strategies which can keep people out of 60 Hz fields”, which would not be applicable for an HVDC system.