4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and discusses the environmental consequences of the E2W Project. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; cumulative impacts; and growth-inducing impacts.

To the extent feasible, this section provides the relevant information outlined in the Secretary of the MEEA's Certificate on the ENF to facilitate the coordinated review procedure outlined in the Secretary of the MEEA's Certificate Establishing an SRP (see section 1.3 and Appendix A).

The environmental consequences of constructing and operating the E2W Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impact could continue for up to 3 years following construction. Impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project.

Algonquin, as part of its proposal, developed certain mitigation measures to reduce the impact of the Project. In some cases, we determined that additional mitigation measures could further reduce the Project's impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also included in section 5.2. We will recommend to the Commission that these measures be included as specific conditions of the Certificate the Commission may issue to Algonquin for this Project. The cooperating agencies will consider these additional mitigation measures as part of their permit decisions.

As discussed in section 3.4.2.3, one alternative (the NSTAR Alternative) possesses sufficient advantages to be considered a reasonable alternative that warrants further review. Therefore, we have included an analysis of the NSTAR Alternative in the major resource topics in this section.

The conclusions in this EIS are based on our analysis of the environmental impact and the following assumptions:

- Algonquin would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this EIS; and
- Algonquin would implement the mitigation measures included in its applications and supplemental submittals to the FERC and cooperating agencies.

4.1 GEOLOGY

4.1.1 Geologic Setting

Pipeline Facilities

The proposed E2W Project is located within the New England Upland and Seaboard Lowland sections of the New England physiographic province. The New England Upland section is characterized by uplifted peneplains with occasional monadnocks that are dissected by narrow valleys. The Seaboard Lowland section is characterized by rolling to flat topography that is generally at a lower elevation than the adjacent New England Upland section (Fenneman, 1938; Hunt, 1967).

Topography along the I-10 Extension generally consists of rolling terrain with elevations ranging from mean sea level (msl) near the Weymouth Fore River to 90 feet above msl. Topography along the Q-1 System Replacement generally consists of rolling terrain with elevations ranging from 40 to 120 feet above msl with slightly more hilly terrain between MPs 12.2 to 15.0. Topography along the E-3 System Replacement generally consists of moderately hilly terrain with elevations ranging from 100 to 365 feet above msl.

The landscape in the area of the proposed Project has been shaped by multiple glacial events. The predominant unconsolidated surficial geologic units in the Project area are glacial till and outwash of late Wisconsinan-age (12,000 to 10,000 years ago). Glacial till is a dense mixture of clay, silt, and gravel whereas glacial outwash comprises sand and gravel. More recent unconsolidated alluvium and organic deposits and ancient crystalline and metamorphic bedrock units, described below, also occur at the surface in the Project area. Table 4.1.1-1 summarizes by length and percent of total the surficial geology crossed by the proposed pipeline routes (Massachusetts Geographic Information System (MassGIS), 1999; Connecticut Department of Environmental Protection (CTDEP), 1995).[1]

Bedrock beneath the I-10 Extension and Q-1 System Replacement is associated with the Brittlely Deformed Terrane lithotectonic subdivision. Approximately 1 mile of the I-10 Extension is underlain by Cambrian-age (543 to 490 million years ago) metamorphic argillite and the remainder is underlain by Proterozoic-age (2.5 billion to 543 million years ago) metamorphic and igneous rocks consisting of granite, gneiss, and gabbro. The entire Q-1 System Replacement is also underlain by Proterozoic-age granite, gabbro, and gneiss. Information on bedrock lithologies in Massachusetts was obtained from the Bedrock Geologic Map of Massachusetts (Zen et al., 1983).

[1] Figures showing the surficial geology crossed by the proposed pipeline routes can be viewed on the FERC Internet website at http://www.ferc.gov as part of Algonquin's Environmental Report filed on June 9, 2008. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20080612-0112 in the "Accession Number" field. The figures are also available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions).

TABLE 4.1.1-1

Surficial Geology Crossed by the HubLine/East to West Project Pipeline Routes

State/Facility/Geologic Unit	Length (miles)	Percent of Total
Massachusetts		
I-10 Extension		
Till or Bedrock	9.6	75%
Sand and Gravel (<50 feet thick)	2.2	17%
Alluvium and Tidal Flat Deposits	0.7	5%
Alluvium	0.3	2%
Sand and Gravel (>50 feet thick)	0.1	1%
Q-1 System Replacement		
Till or Bedrock	3.2	43%
Sand and Gravel (<50 feet thick)	1.8	24%
Alluvium	1.3	17%
Sand and Gravel (>50 feet thick)	1.2	16%
Connecticut		
E-3 System Replacement		
Thin Till or Bedrock	8.7	79%
Swamp Deposits	0.9	8%
Sand and Gravel	0.7	6%
Alluvium	0.3	3%
Till, Sand and Gravel, Boulders	0.2	2%
Thick Till (>10-15 feet thick)	0.1	1%
Gravel	0.1	1%

Sources: MassGIS, 1999; CTDEP, 1995.

Bedrock beneath the E-3 System Replacement is associated with the Iapetos Terrane of the Eastern Uplands lithotectonic subdivision. This bedrock consists of Ordovician-age (490 to 437 million years ago) metamorphic and igneous rocks consisting of schist, gneiss, and gabbro. Information on bedrock lithologies in Connecticut was obtained from the Bedrock Geological Map of Connecticut (Rodgers, 1985). Table 4.1.1-2 lists the geologic units crossed by the proposed pipeline routes.

The Q-1 and E-3 System Replacements would be installed within Algonquin's existing right-of-way except for minor route variations generally related to waterbody crossings or residential areas or to avoid other sensitive features (see section 3.5). Similarly, the majority of the I-10 Extension would be located within or adjacent to NSTAR's existing right-of-way. Over most of the Project area, natural topographic slope and contours would be temporarily altered by the small-scale grading of the construction right-of-way that is necessary to provide a level and safe work surface for equipment and by trenching activities. After completion of construction, Algonquin would restore topographic contours and drainage conditions as closely as feasible to their preconstruction condition. Therefore, construction and operation of the proposed pipelines would not materially alter the existing geologic conditions of the Project area.

TABLE 4.1.1-2

Bedrock Geology Crossed by the HubLine/East to West Project Pipeline Routes

State/Facility/ Mileposts	Geologic Symbol - Unit	Geologic Period/Era	Description
Massachusetts			
I-10 Extension			
0.0-1.0	Cbw – Braintree Argillite and Weymouth Formation	Cambrian	Weakly metamorphosed mudstone or shale without the fissility of shale.
1.0-7.9	Zdgr – Dedham Granite	Proterozoic	Light pinkish to greenish gray granite.
7.9-8.4	Zdi - Diorite	Proterozoic	Medium-grained, hornblende diorite that is metamorphosed in places to amphibolites and hornblende gneiss.
8.4-9.0	Zdgr – Dedham Granite	Proterozoic	Light pinkish to greenish gray granite.
9.0-12.4	Zdi - Diorite	Proterozoic	Medium-grained, hornblende diorite that is metamorphosed in places to amphibolites and hornblende gneiss.
12.4-12.9	Zdgr – Dedham Granite	Proterozoic	Light pinkish to greenish gray granite.
Q-1 System Replacement			
12.2-14.8	Zssy – Sharon Syenite	Proterozoic	Gray to dark syenite with micropherthite, oligoclase, and clinopyroxene mixed with ferro-gabbro.
14.8-16.1	Zdi - Diorite	Proterozoic	Medium-grained, hornblende diorite that is metamorphosed in places to amphibolites and hornblende gneiss.
16.1-19.7	Zdgr – Dedham Granite	Proterozoic	Light pinkish to greenish gray granite.
Connecticut			
E-3 System Replacement			
0.0-0.3	Otay – Yantic Member of the Tatnic Hill Formation	Ordovician	Gray to dark gray, fine- to medium-grained schist.
0.3-0.6	Otaf – Fly Pond Member of the Tatnic Hill Formation	Ordovician	Light gray, medium-grained calc-silicate gneiss.
0.6-8.6	Ota – Tatnic Hill Formation	Ordovician	Gray to dark gray, medium-grained gneiss or schist.
8.6-9.9	Oq – Quinnebaug Formation	Ordovician	Gray to dark gray, medium-grained, well layered gneiss.
9.9-10.1	Opd – Preston Gabbro (diorite phase)	Ordovician	Medium to dark gray, streaked, medium-grained diorite.
10.1-11.0	Op – Preston Gabbro	Ordovician	Mafic, medium- to coarse-grained, massive igneous rock.

Sources: Zen, et al., 1983; Rodger, 1985.

Aboveground Facilities, Pipe Storage and Contractor Ware Yards, and Access Roads

The proposed Rehoboth Compressor Station would be located in relatively flat terrain at approximately 100 feet above msl. Surficial geology at the proposed compressor station site consists of thin till or bedrock (MassGIS, 1999). The site is located in the Narragansett Basin lithotectonic subdivision and is situated in an area that is underlain by the Rhode Island Formation, which consists of a mix of sedimentary rocks including sandstone, greywacke, shale, and conglomerate with minor meta-anthracite beds (Zen et al., 1983).

The remaining aboveground facilities, pipe storage and contractor ware yards, and access roads associated with the Project would be located within the same general physiographic and geologic setting as the proposed pipeline routes described above. Construction and operation of the Rehoboth Compressor Station and other aboveground facilities, pipe storage and contractor ware yards, and access roads would not materially alter existing geologic conditions in the Project area.

4.1.2 Mineral Resources

Pipeline Facilities

Mineral resources in eastern Massachusetts consist mainly of construction sand and gravel and crushed stone. In 2005, construction sand and gravel and crushed stone accounted for 95 percent of the non-fuel mineral income in Massachusetts (USGS, 2005). Similarly, construction sand and gravel and crushed stone accounted for greater than 99 percent of the non-fuel mineral income in Connecticut in 2005 (USGS, 2005). Other mineral resources in Massachusetts and Connecticut include granite, quartzite, sandstone, common clay, and lime (USGS, 2005). Historically, no oil or gas exploration and production has occurred in Massachusetts or Connecticut (Biewick, 2008).

USGS topographic maps and aerial photography were used to identify surface features possibly associated with mining or mineral resources. After further investigation, the majority of the areas identified during the review of the topographic maps and aerial photography were determined to have no active or planned mining activities. However, based on landowner communications, the property located about 2,100 feet southwest of MP 10.6 of the I-10 Extension is being actively mined for blue stone. In addition, a sand and gravel pit located approximately 1,000 feet southwest of MP 9.2 of the E-3 System Replacement shows evidence of active mining. Pipeline projects have the potential to affect the production of mineral resources by restricting mineral production activities in the immediate vicinity of the permanent pipeline right-of-way and at aboveground facility sites due to mining setback restrictions. Although portions of the proposed pipeline routes would be located in proximity to potentially extractable mineral deposits, 80 percent of the proposed routes would be constructed within or adjacent to the existing Algonquin pipeline right-of-way and/or NSTAR powerline right-of-way, which already preclude surface mining operations. Therefore, construction and operation of the pipelines would not result in a significant, additional restriction to current or future mining operations in the area. In addition, due to the abundance of sand and gravel deposits in the area, construction and operation of the pipelines would not have a significant effect on the availability of sand and gravel in the region.

Surface mining operations also pose potential hazards to pipelines due to encroachment on the pipeline by machinery or trucks, increasing slope instability by oversteepening slopes or by changing surface and groundwater conditions, and blasting. Nearby surface mining operations should not affect the proposed pipelines provided they do not encroach onto the pipeline rights-of-way. The potential for encroachment onto the pipeline rights-of-way would be minimized because the majority of the pipeline routes would be located in or adjacent to Algonquin's and/or NSTAR's existing rights-of-way, which were established in the 1950s and 1920s, respectively, and the locations of which are well documented. Algonquin participates in the "One-Call" and "Call Before You Dig" programs and other related pre-excavation notification organizations in the states in which it operates, which would substantially reduce the potential for third-party excavation activity, such as mining, to impact the pipelines. In addition, Algonquin would mark the pipeline facilities at line-of-sight intervals and at crossings of roads and other key points, further reducing the potential for third-party excavation activity to encounter the pipelines.

Aboveground Facilities, Pipe Storage and Contractor Ware Yards, and Access Roads

Based on a review of USGS topographic maps and aerial photography, no apparent active mining operations were identified within 2,500 feet of the Rehoboth Compressor Station site, additional aboveground facilities or permanent access roads. Some of the pipe storage and contractor ware yards and temporary access roads may be located in proximity to active or potential mineral resource operations. However, these would only be used temporarily during construction of the Project and would not preclude future mining operations in the area.

4.1.3 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, and soil liquefaction), landslides, flash flooding, and ground subsidence. Conditions necessary for the development of other geologic hazards including regional subsidence, avalanches, and volcanism, are not present in the Project area. In general, the potential for geologic hazards to significantly affect construction or operation of the proposed pipelines is low.

No geologic hazards have been identified at the Rehoboth Compressor Station or additional aboveground facilities.

The pipe storage and contractor ware yards and access roads would be located in the same general vicinity of the pipeline routes. Construction activities at the majority of these facilities would be largely confined to previously disturbed areas and would not materially alter the existing geologic conditions of the Project area or create an increased threat from geologic hazards.

4.1.3.1 Seismicity

Earthquakes and Surface Faults

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), or where plates are sliding past each other (e.g., California). Unlike these highly active tectonic regions, the east coast of the United States is located on the "trailing edge" of the North American continental plate, which is relatively seismically quiet.

Earthquakes, however, do occur in the Project area, largely due to trailing edge tectonics and residual stress release from past orogenic (mountain building) events. The Project area is characterized by low magnitude events that have been recorded since the mid-16th century. According to the USGS (2008a), the largest recorded earthquake in Massachusetts occurred in 1755 near Cape Ann, approximately 40 miles northeast of the Project area. This earthquake is estimated to have been a magnitude 6 event on the Richter scale that resulted in Modified Mercalli Intensity[2] (MMI) VIII damage in the Boston area. Such an event today would cause considerable damage to ordinary, substantial buildings but only slight damage to specially designed structures. The largest recorded earthquake in Connecticut was an MMI VII event that occurred at East Haddam in 1791, approximately 23 miles west of the Project area. Such an event today would cause slight to moderate damage in well built ordinary structures, but only negligible damage in buildings of good design and construction. The largest earthquakes in New England, other than those that have occurred near Cape Ann, have been near Ossipee, New Hampshire, approximately 100 miles north of the Project area (Simmons, 1976).

The USGS has mapped the seismic hazard for the entire United States based on historical earthquake activity and extensive modeling. According to the USGS (2008a), a 500-year earthquake in the Project area would result in a horizontal peak ground acceleration (PGA) of 4 percent of gravity or less. The USGS indicates that a PGA of 10 percent gravity is the approximate level of shaking required to damage poorly built structures. Therefore, the Project area is unlikely to experience a damaging earthquake during the operating life of the proposed facilities.

[2] The Modified Mercalli Intensity Scale uses the observations of the people who experienced the earthquake to estimate its intensity. Intensity ranges from an earthquake intensity value of I, in which the earthquake is not felt, to an intensity value of XII, in which damage is nearly total, large rock masses are displaced, and objects are thrown into the air.

In addition to causing ground shaking, earthquakes can result in surface faults that, if significant, can damage structures, roads, and underground utilities such as pipelines. Due to the relatively low magnitude of seismic activity in the Project area, the potential for significant surface faulting to occur is also low. Neither the proposed pipelines nor aboveground facilities would cross any surface faults that have been active in the Quaternary Period (2 million years ago to the present) (National Atlas of the United States, 2008; USGS, 2006a).

Empirical reviews of historical earthquakes demonstrate that pipelines are not prone to failure due to earthquakes. A 1996 study of earthquake performance data for steel transmission lines and distribution supply lines operated by Southern California Gas Company over a 61-year period found that post-1945 arc-welded transmission pipelines in good repair have never experienced a break or leak during a southern California earthquake. These pipelines are the most resistant type of piping, vulnerable only to very large and abrupt ground displacement (e.g., severe landslides), and are generally highly resistant to traveling ground wave effects and moderate amounts of permanent deformation (O'Rourke and Palmer, 1996).

The proposed facilities would be constructed to meet federal standards outlined in Title 49 CFR Part 192. These are the same regulations that govern the construction and operation of natural gas pipelines throughout the country, including areas with greater seismic hazards. Thus, the pipeline facilities would be able to withstand both the intensity and duration of transient ground motions resulting from seismic activity in the Project area.

Soil Liquefaction

Soil liquefaction is a phenomenon often associated with seismic activity in which saturated, non-cohesive soils temporarily lose their strength and liquefy (i.e., behave like viscous liquid) when subjected to forces such as intense and prolonged ground shaking. Soil liquefaction can affect the integrity of a pipeline by causing lateral spreading, flow failures, loss of bearing strength, and flotation. The FERC defines areas with potential for seismic soil liquefaction in the "Order Establishing Guidelines for the Submission of Required Data for Pipeline Projects" issued July 27, 1988. Based on these guidelines, soil conditions necessary for soil liquefaction to occur would likely be present in the Project area. However, due to the low potential for strong and prolonged ground shaking associated with a seismic event to occur, the potential for soil liquefaction to occur is also low.

4.1.3.2 Landslides

Landslides involve the down slope movement of earth materials under a force of gravity due to natural or man-made causes. The majority of the proposed Project is within an area of low landslide incidence and susceptibility except for MPs 0.0 to 3.8 of the I-10 Extension that would cross an area of moderate landslide susceptibility (Radbruch-Hall et al., 1982; Godt, 1997). Based on an analysis of the Soil Survey Geographic (SSURGO) database, which contains digital soil survey data, the majority (69 percent) of the soils crossed by this northern portion of the I-10 Extension have slopes greater than or equal to 9 percent and would, therefore, be more susceptible to landslides. Overall, 50 percent of the pipeline route crosses soils with slopes of 9 percent or more (USDA, 2003). The Office of the Massachusetts State Geologist (2008) also reports that "nuisance" landslides occasionally occur in the state. However, the majority of the slopes within the Project area are underlain by till or bedrock that are less vulnerable to landslides.

The DOT and other affiliated agency specifications provide adequate protection from washouts, floods, unstable soils, and landslides that may occur in the Project area. Pipeline installation techniques, especially padding and use of rock-free backfill, effectively insulate the pipeline from minor earth

movements. In areas where the pipeline would be installed perpendicular to the slope, the overall energy to which a segment of pipe would be exposed during a landslide event would be limited by the length of the slope. In areas where the pipeline would be installed parallel to the slope, the angle of the slope, as well as the composition of the soil and rock present, would likely limit the extent of landslide events. Therefore, it is expected that any landslide events would, at worst, expose a short section of pipe along the slope face, requiring subsequent reburial. If areas are identified where slope instability could occur during wet periods, erosion control measures specified in Algonquin's E&SCP (see Appendix F) would be implemented to reduce the potential for slope failure to occur.

4.1.3.3 Flash Flooding

The potential for flash flooding to occur and significantly impact construction or operation of the proposed Project is low. The greatest potential for flash flooding to occur along waterbodies in the Project area is associated with tropical storms, which are usually accompanied by significant precipitation over a short period of time. The potential effects associated with high rainfall events during construction would be mitigated by implementing the measures in Algonquin's E&SCP. These measures include providing the necessary equipment to handle waterbody flow increases during pipeline removal or installation activities such as having additional pumps on stand-by for dam-and-pump crossings or appropriately sizing flumes to handle storm flows for flume crossings. In addition, equipment bridges would be designed to handle higher flow volumes that could be anticipated from storm events and flooding situations. Following construction, each waterbody crossing would be periodically inspected for signs of erosion and remediated, as necessary.

4.1.3.4 Ground Subsidence

Common causes of ground subsidence include the presence of karst terrain, underground mining, and significant fluid withdrawal such as in oil-producing regions.

Karst features such as sinkholes, caves, and caverns can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone and dolostone). However, the geologic conditions necessary for the development of karst terrain are limited to the western portions of Massachusetts and Connecticut. Based on Davies et al. (1984), no karst features are present in the vicinity of the E2W Project.

Underground mining poses risks to engineered structures due to the potential of the overlying strata to collapse into the void formed by the extraction of minerals. Algonquin conducted a search of the federal records included in the Mines Master Index File (MINES) that contains all MINES identification numbers issued for mines active or opened since 1971, and also includes any violation information. Based on this database search, no underground mining activities exist in the Project area. Therefore, the E2W Project would not be subject to hazards associated with underground mines.

The proposed Project is not located in an area of oil and gas production; therefore, regional subsidence from petroleum production would not impact the Project.

4.1.3.5 Shallow Bedrock and Blasting

Although shallow bedrock is not a geologic hazard in itself, blasting activities associated with the occurrence of shallow bedrock can create a potential hazard to nearby structures. The typical depth of the trench that would be necessary to install the pipelines would be about 7 feet along the I-10 Extension and Q-1 System Replacement and 5 to 6 feet along the E-3 System Replacement. Areas of soils with a

shallow depth to bedrock are discussed in section 4.2.1.1. In areas where mechanical equipment cannot break up or loosen the bedrock, blasting would be required before excavation.

Algonquin conducted field surveys to identify where blasting may need to be employed. Based on these field surveys, Algonquin identified 4.7 miles where blasting may be needed, including 3.8 miles of the I-10 Extension and 0.9 mile of the Q-1 System Replacement. These areas were identified based on the observation of surface ledge outcroppings and boulders in conjunction with observation of surrounding areas where road cuts and other excavations were evident and visible. Algonquin did not provide field survey results for the E-3 System Replacement; however, based on available soils data, it appears that blasting may be needed along approximately 2.4 miles of the route (see section 4.2.1.1). Table 4.1.3-1 lists by milepost the areas along the pipeline routes where blasting may be needed. The majority of these areas would be located in or adjacent to the NSTAR right-of-way.

TABLE 4.1.3-1

Areas Where Blasting May be Needed along the HubLine/East to West Project Pipeline Routes [a]

State/Facility/Beginning Milepost	Ending Milepost	Miles
Massachusetts		
I-10 Extension		
1.4	1.6	0.2
2.0	2.2	0.2
2.9	3.0	0.1
3.4	3.8	0.4
3.9	4.2	0.2
4.2	4.3	0.0
4.4	4.6	0.2
4.6	5.1	0.5
5.2	5.3	0.1
5.6	5.9	0.3
7.8	8.0	0.1
8.3	8.6	0.3
9.3	9.4	0.1
9.5	9.7	0.2
11.1	11.6	0.6
12.0	12.0	0.0
12.6	13.0	0.4
I-10 Extension Subtotal		3.8
Q-1 System Replacement		
14.5	14.8	0.3
14.9	15.3	0.4
17.8	18.0	0.2
18.0	18.1	0.1
Q-1 System Replacement Subtotal		0.9
Project Total		**4.7**

[a] Algonquin did not provide field survey results for the E-3 System Replacement; however, based on soils data, it appears that blasting may be needed along approximately 2.4 miles of the route.

Note: The totals in this table may not equal the sum of addends due to rounding.

Algonquin has prepared a Blasting Plan to minimize the effects of blasting and ensure safety during blasting operations (see Appendix K). All blasting techniques would comply with federal, state, and local regulations governing the safe storage, handling, firing, and disposal of explosive materials.

Algonquin would conduct pre-blasting inspections to assess and document the condition of all structures, wells, springs, and utilities within 150 feet, or farther if required by local or state regulations, of the construction right-of-way. NSTAR expressed concerns that blasting in conjunction with the proposed Project could compromise the foundations of its existing electric transmission line towers in those areas where the proposed I-10 Extension would be within NSTAR's existing right-of-way. Any blasting that may be necessary in NSTAR's right-of-way would be coordinated with NSTAR representatives. To minimize damage to adjacent areas and structures during blasting, Algonquin's contractors would take precautionary measures including the use of matting or other suitable cover, as necessary, to prevent fly-rock from damaging adjacent areas, posting warning signals, flags, or barricades, and the dissemination of blast warning signals in the area of blasting. The contractor would keep a record of each blast, along with a seismograph report, to be submitted to the Algonquin blasting inspector. Following the completion of blasting operations, an independent contractor would examine the condition of all structures within 150 feet, or as required by state or local ordinances. In addition, Algonquin has committed to developing site-specific blasting plans for those locations where blasting would occur near existing electric transmission towers and would provide these plans to NSTAR for review. These measures would minimize the potential for blasting to damage NSTAR's powerline towers or other structures in proximity to the blasting activity. Furthermore, Algonquin has stated that, if any blasting-related damages are identified, Algonquin would either provide compensation to the affected landowner or arrange for the necessary repairs. The contractor would be responsible for supplying explosives and blasting materials that are perchlorate-free in order to eliminate the potential for perchlorate contamination of groundwater. We reviewed Algonquin's Blasting Plan and find it acceptable.

Generally, excavated rock would be used to backfill the trench to the top of the existing bedrock profile. Relatively rock-free material would first be placed around the pipe to avoid damage to the pipe and coating. Large rock not suitable for use as backfill material would be windrowed along the edge of the right-of-way (with the landowner's permission), used to construct ORV barriers, used as riprap for streambank stabilization (where allowed by applicable regulatory agencies), or hauled off the right-of-way and disposed of in an approved area. Algonquin would negotiate with the landowner and obtain permission to permanently store rock along, over, through, or across the right-of-way.

4.1.4 NSTAR Alternative

The NSTAR Alternative would be located within the same general physiographic and geologic setting as the I-10 Extension and Q-1 System Replacement. The NSTAR Alternative would be located within 2,500 feet of two additional mineral operations to those discussed in section 4.1.2. As with the proposed pipeline routes, the NSTAR Alternative would be located in an area with relatively low potential for significant seismic activity, soil liquefaction, landslides, flash flooding, and ground subsidence. Based on soils data, the NSTAR Alternative would cross 0.7 less mile of shallow-to-bedrock soils than the corresponding segment of the proposed route, which could result in the need for less blasting.

4.2 SOILS

4.2.1 Existing Soil Resources

The soils crossed by the proposed Project were identified and assessed using the SSURGO database (USDA, 2003) and the Soil Surveys of Norfolk and Suffolk Counties, Massachusetts (USDA, 1989) and New Haven County, Connecticut (USDA, 1979). The SSURGO database is a digital version of the original county soil surveys developed by the USDA, Natural Resources Conservation Service (NRCS) for use with geographic information systems (GIS). It provides the most detailed level of soils information for natural resource planning and management. The attribute data within the SSURGO database give the proportionate extent of the component soils and their properties for each soil map unit (USDA, 1995). Additional information about the soils in the Project area was obtained from Official Soil Series Descriptions (USDA, 2004).

The proposed Project is located in the New England and Eastern New York Upland, Southern Part Major Land Resource Area (MLRA). Physiography in this area is characterized by rolling to hilly uplands that are broken by many gently sloping to level valleys that terminate in coastal lowlands. Although elevations throughout the majority of this MLRA range from msl to 1,000 feet above msl, as discussed in section 4.1.1, the elevations of the proposed facilities range from msl to 365 feet above msl. The dominant soil orders in this area are Entisols, Histosols, and Inceptisols. These very deep, somewhat excessively drained to poorly drained soils have a loamy or sandy texture, mesic soil temperature regime, aquic or udic soil moisture regime, and mixed mineralogy.

4.2.1.1 Pipeline Facilities

The majority of the soils that would be crossed by the proposed pipeline routes consist of deep to very deep, moderately well to well drained, sandy and loamy textured soils formed in glacial till and outwash. Areas of poorly to very poorly drained, mineral and organic soils are located in depressions and drainageways within the glacial deposits.[3]

The soils along the proposed pipeline routes were evaluated to identify prime farmland and major soil characteristics that could affect construction or increase the potential for adverse construction-related soil impacts. The soil characteristics evaluated include erosion potential, whether the soils are hydric, the potential for compaction, the presence of stones or rocks, depth to bedrock, and revegetation concerns. Table 4.2.1-1 summarizes the amount of prime farmland and the significant soil characteristics that would be crossed by the proposed pipeline facilities. Individual soils characteristics and the potential mitigation measures that would be employed to reduce impacts on soils are discussed below.

[3] Figures showing the soil map units crossed by the proposed pipeline routes can be viewed on the FERC Internet website at http://www.ferc.gov as part of Algonquin's Environmental Report filed on June 9, 2008. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20080612-0114 in the "Accession Number" field. The figures are also available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions).

TABLE 4.2.1-1

Characteristics of Soils Crossed by the HubLine/East to West Project Pipeline Facilities

State/Facility	Total Acres [a]	Prime Farmland [b]	Highly Erodible		Hydric [b]	Compaction Prone [e]	Stony/ Rocky [f]	Shallow to Bedrock [g]	Reveg. Concerns [h]
			Water [c]	Wind [d]					
Massachusetts									
I-10 Extension	162.2	3.8	102.5	9.0	22.9	8.3	84.5	35.6	105.2
Q-1 System Replacement	95.1	17.1	51.0	6.0	26.0	4.8	36.2	6.3	54.8
Connecticut									
E-3 System Replacement	122.3	15.0	43.7	1.0	26.1	16.9	11.5	26.4	85.2
Project Total	379.6	35.9	197.2	16.0	74.9	30.0	132.2	68.3	245.1

[a] Acreage includes the proposed nominal construction right-of-way (85-foot-wide for the I-10 Extension and Q-1 System Replacement and 75-foot-wide for the E-3 System Replacement) and areas where the right-of-way is wider than the nominal 75- to 85-foot-wide configuration as well as staging areas and extra workspaces at feature crossings. Total acreage does not include open water. Acreage of soils characteristics crossed is based on the relative crossing length of each soil map unit along the pipeline routes. Values within a row do not add up to the total listed in the total column because soils may occur in more than one characteristic class or may not occur in any class listed in the table.

[b] As designated by the NRCS.

[c] Includes soils designated by the NRCS as highly erodible or potentially highly erodible land.

[d] Includes soils in wind erodibility group designation of two or less.

[e] Includes soils in somewhat poor to very poor drainage classes with surface textures of sandy clay loam and finer.

[f] Includes soils with a cobbley, stony, bouldery, shaly, very gravelly, or extremely gravelly modifier to the textural class of the surface layer and/or that have a surface layer that contains greater than 5 percent by weight stones larger than 3 inches.

[g] Includes soils identified as containing bedrock at a depth of 5 feet or less from the surface.

[h] Includes soils with a surface texture of sandy loam or coarser that are moderately well to excessively drained.

Source: USDA, 2003.

Prime Farmland

The USDA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops" (USDA, 1993). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

Approximately 9 percent (35.9 acres) of the soils that would be crossed by the proposed pipeline routes are considered prime farmland including 2 percent (3.8 acres) of the I-10 Extension, 18 percent (17.1 acres) of the Q-1 System Replacement, and 12 percent (15.0 acres) of the E-3 System Replacement.

Erosion by Water and Wind

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetative cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. Wind erosion processes are less affected by slope angles than water erosion processes. Wind-induced erosion often occurs on dry, fine-textured soil where

vegetative cover is sparse and strong winds are prevalent. Clearing, grading, and equipment movement could accelerate the erosion process and, without adequate protection, result in discharge of sediment to waterbodies and wetlands. Soil loss due to erosion could also reduce soil fertility and impair revegetation.

Approximately 32 percent (120.0 acres) of the soils along the proposed pipeline routes are designated as highly erodible land (HEL) that is susceptible to erosion by water including 46 percent (74.5 acres) of the I-10 Extension, 23 percent (22.3 acres) of the Q-1 System Replacement, and 19 percent (23.3 acres) of the E-3 System Replacement. An additional 20 percent (77.2 acres) of the soils along the proposed pipeline routes are designated as potentially highly erodible land (PHEL) including, 17 percent (28.0 acres) of the I-10 Extension, 30 percent (28.8 acres) of the Q-1 System Replacement, and 17 percent (20.4 acres) of the E-3 System Replacement. PHEL consists of those soils that have the potential to be highly erodible, but cannot be designated as HEL without a field determination of slope percent and length. About 4 percent (16.0 acres) of all soils that would be crossed by the proposed pipeline routes have a wind erodibility group designation of two or less and are considered susceptible to wind erosion. This includes 6 percent (9.0 acres) of the I-10 Extension, 6 percent (6.0 acres) of the Q-1 System Replacement, and 1 percent (1.0 acre) of the E-3 System Replacement.

Hydric Soils

Hydric soils are defined as "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register, 1994). Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Hydric soils include very poorly, poorly, and somewhat poorly drained soils. Due to extended periods of saturation, hydric soils can be prone to compaction and rutting as discussed below. In addition, high groundwater levels associated with hydric soils could create a buoyancy hazard for the pipeline.

Approximately 20 percent (74.9 acres) of the soils crossed by the proposed pipeline facilities are considered hydric soils including 14 percent (22.9 acres) of the I-10 Extension, 27 percent (26.0 acres) of the Q-1 System Replacement, and 21 percent (26.1 acres) of the E-3 System Replacement.

Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils (i.e., sandy clay loam or finer) with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting.

Approximately 8 percent (30.0 acres) of the soils crossed by the proposed pipeline facilities are considered prone to compaction including 5 percent (8.3 acres) of the I-10 Extension, 5 percent (4.8 acres) of the Q-1 System Replacement, and 14 percent (16.9 acres) of the E-3 System Replacement.

Stony/Rocky and Shallow-to-Bedrock Soils

The presence of rocks in soils may reduce moisture-holding capacity, resulting in a reduction of soil productivity. Additionally, some agricultural equipment may be damaged by contact with large rocks. The presence of rocks within the surface horizons and/or shallow bedrock may also create poor revegetation conditions.

Approximately 18 percent (68.3 acres) of the soils crossed by the proposed pipeline routes would be underlain by shallow bedrock (less than 5 feet from the surface) including 22 percent (35.6 acres) of

the I-10 Extension, 7 percent (6.3 acres) of the Q-1 System Replacement, and 22 percent (26.4 acres) of the E-3 System Replacement. Blasting or other special construction techniques may be required in these areas during installation of the proposed pipeline (see section 4.1.3.5).

Stony/rocky soils are identified as soils that have a very gravelly, extremely gravelly, cobbley, stony, boulder, or shaly modifier to the textural class of the surface layer, or have a surface layer that contains greater than 5 percent (weight basis) stones larger than 3 inches in diameter. Approximately 35 percent (132.2 acres) of stony/rocky soils would be crossed by the proposed pipeline routes including 52 percent (84.5 acres) of the I-10 Extension, 38 percent (36.2 acres) of the Q-1 System Replacement, and 9 percent (11.5 acres) of the E-3 System Replacement.

Revegetation Potential

Successful restoration and revegetation are important for maintaining soil productivity and protecting the underlying soil from potential damage, such as erosion. The revegetation potential of soils crossed by the proposed Project was evaluated based on the soil surface texture, slope, and drainage class. Soils that have a coarse surface texture (i.e., sandy loam or coarser) and are moderately well to excessively drained may prove to be difficult to revegetate because drier soils have less water to aid in seed germination and the eventual establishment of new vegetation. The coarser-textured soils also have a lower water holding capacity following precipitation, which could result in moisture deficiencies in the root zone and create unfavorable conditions for many plants. In addition, steep slopes (greater than 8 percent) along the pipeline routes may make the establishment of vegetation difficult. The clearing and grading of soils with poor revegetation potential could result in a lack of adequate vegetation following construction and restoration of the right-of-way, which could lead to increased erosion, a reduction in wildlife habitat, and adverse visual impacts.

About 65 percent (245.1 acres) of the proposed pipeline routes would cross soils with revegetation concerns including 65 percent (105.2 acres) of the I-10 Extension, 58 percent (54.8 acres) of the Q-1 System Replacement, and 70 percent (85.2 acres) of the E-3 System Replacement.

4.2.1.2 Aboveground Facilities

Construction and operation of the Rehoboth Compressor Station would affect 16.8 acres of soils, of which 10.3 acres would be permanently converted to commercial/industrial uses. Construction and operation of the remaining aboveground facilities would affect 11.1 acres of soils, of which 4.8 acres would be permanently converted to commercial/industrial uses. The soils at the proposed Beginning-of-Q-1 System OPP Regulator Station and pig launcher/receiver are considered prime farmland. None of the soils that would be impacted by the remaining facilities are considered prime farmland. Table 4.2.1-2 summarizes the soil characteristics at the proposed aboveground facility sites.

4.2.1.3 Pipe Storage and Contractor Ware Yards

Algonquin has identified six pipe storage and contractor ware yards that would be used during construction (see table 2.2.3-1). These yards would temporarily affect approximately 69.3 acres of land. Fifteen percent (10.5 acres) of the soils within these yards are considered prime farmland, 61 percent (41.8 acres) are considered susceptible to wind or water erosion, and 84 percent (58.2 acres) have revegetation concerns. None of the soils at the pipe storage and contractor ware yards are considered hydric or prone to compaction. The majority of the proposed yards have been previously disturbed by commercial/industrial activities and the sites would be returned to preconstruction conditions, so no new permanent impacts on prime farmland would result from use of the sites.

TABLE 4.2.1-2

Soil Characteristics at the Aboveground Facility Sites Associated with the HubLine/East to West Project

Facility	Total Acres [a]	Prime Farmland [b]	Highly Erodible		Hydric [b]	Compaction Prone [e]	Stony/ Rocky [f]	Shallow to Bedrock [g]	Reveg. Concerns [h]
			Water [c]	Wind [d]					
Rehoboth Compressor Station	16.8	0.0	5.6	0.0	11.3	0.0	16.9	0.0	5.6
Fore River OPP Regulator Station and Pig Launcher	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beginning-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	1.6	1.6	1.6	0.0	0.0	0.0	0.0	0.0	1.6
Sharon OPP Regulator Station	0.9	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0
End-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	2.7	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0
Beginning of E-3 System Pig Launcher	1.3	0.0	1.3	0.0	0.0	0.0	0.0	0.5	0.8
End-of-E-3 System Pig Launcher/Receiver	0.9	0.0	0.9	0.0	0.0	0.0	0.0	0.4	0.6
Mainline Valves, Taps, and Remote Blow-off Valves	2.4	0.0	0.3	0.5	0.9	0.0	0.4	0.6	0.7
Total Acres	27.9	1.6	9.6	4.1	12.2	0.0	17.3	1.5	9.2

[a] Acreage is based on the facility footprint and includes temporary extra workspace used during construction of the facilities. Acreage does not include permanent access roads. Values within a row do not add up to the total listed in the total column because soils may occur in more than one characteristic class or may not occur in any class listed in the table.

[b] As designated by the NRCS.

[c] Includes soils designated by the NRCS as highly erodible or potentially highly erodible land.

[d] Includes soils in wind erodibility group designation of two or less.

[e] Includes soils in somewhat poor to very poor drainage classes with surface textures of sandy clay loam and finer.

[f] Includes soils with a cobbley, stony, bouldery, shaly, very gravelly, or extremely gravelly modifier to the textural class of the surface layer and/or that have a surface layer that contains greater than 5 percent by weight stones larger than 3 inches.

[g] Includes soils identified as containing bedrock at a depth of 5 feet or less from the surface.

[h] Includes soils with a surface texture of sandy loam or coarser that are moderately well to excessively drained.

Source: USDA, 2003.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

4.2.1.4 Access Roads

Algonquin proposes to utilize 42 access roads during construction of the E2W Project of which 38 are existing roads. Of these, 13 roads would be maintained for permanent access to the pipeline right-of-way and Rehoboth Compressor Station. Nine of the permanent access roads would be located along existing roads, some of which would require minor modifications and improvements. The remaining permanent access roads needed for access to the Q-1 System Replacement and the Rehoboth Compressor Station would be new roads that would require clearing, grading, and filling. These new, permanent access roads would impact about 2.3 acres of land, of which 0.3 acre is considered prime farmland.

4.2.2 General Impact and Mitigation

Construction activities such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way may affect soil resources. Clearing removes protective vegetative cover and exposes the soil to the effects of wind, rain, and runoff, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential. Construction activities can also affect soil fertility and facilitate the dispersal and establishment of weeds.

Construction activities such as grading, trenching, and backfilling can also cause mixing of soil horizons. Mixing of topsoil with subsoil, particularly in agricultural lands, dilutes the superior chemical and physical properties of the topsoil and lowers soil fertility and the ability of disturbed areas to revegetate successfully. Excess rocks on or near the soil surface could interfere with agricultural practices and hinder restoration of the right-of-way. Trenching of stony/rocky or shallow-to-bedrock soils can bring stones or rock fragments to the surface. Soils with bedrock present at depths of 5 feet or less may require blasting, which may result in excess rock being brought to the soil surface. In areas where the proposed pipeline routes would cross stony/rocky soils, the potential to introduce stone and rock into surface soils could be significant. However, the soils in those areas already contain surface layers with significant quantities of stones and gravel.

Construction can also facilitate the establishment of noxious weeds where none or few existed. The clearing of existing perennial vegetation provides an opportunity for weed species to invade the right-of-way, and the movement of equipment along the right-of-way could transport weed seed and plant parts from one location to another (see section 4.5.4). The seriousness of these effects would depend on the prevalence of weeds in the area of the pipeline route, the type of weed and its method of reproduction and dispersal, and the weed's effect on current or future land use.

To reduce the impacts of construction on soils, Algonquin would implement its Project-specific E&SCP (see Appendix F) that incorporates many of the mitigation measures outlined in the FERC Plan and Procedures. Algonquin's E&SCP includes measures to control erosion and sedimentation during construction and to ensure proper revegetation for erosion control following construction. Relevant mitigation measures specified in the E&SCP include:

- Topsoil would be segregated over the full right-of-way or trench plus spoil area. The top 12 inches of topsoil would be segregated in areas of deep soils (more than 12 inches of topsoil). In areas where the topsoil layer is less than 12 inches, Algonquin would make every effort to segregate the entire layer of topsoil.

- Temporary erosion control measures, such as temporary slope breakers and mulch, would be installed during construction. Permanent erosion control measures (e.g., permanent slope breakers, trench breakers, revegetation of the disturbed areas) would be maintained following construction.

- Sediment barriers, such as silt fencing and/or straw bales, would be installed before ground-disturbing activities to prevent sediment flow from construction areas into waterbodies, wetlands, and roads.

- Construction work areas would be restored to preconstruction conditions. Excess rocks brought to the surface during construction activities would be removed from at least the top 12 inches of the soil in all agricultural and residential areas, and other areas at the landowner's request. Algonquin would remove excess rock/stone such that the size,

density, and distribution of rock on the construction right-of-way would be similar to adjacent non-right-of-way areas.

- Except for the aboveground facilities, all areas disturbed by Project-related activities would be revegetated following construction. Temporary erosion control measures would be installed to stabilize the work area following seeding.

Post-construction monitoring of mitigation practices would be conducted to ensure their successful implementation. Revegetated areas would be monitored following construction for the first and second (as necessary) growing season in upland areas, including agricultural land, and at least 3 years in wetlands to ensure successful restoration (see section 2.5).

In its E&SCP, Algonquin does not propose to conduct compaction testing and mitigation in residential areas. Algonquin's E&SCP states that topsoil would either be segregated or replaced in residential areas, thereby resulting in minimal compaction and providing a suitable medium for grass. Algonquin also states that most yard areas that are sown in grass do not require deep root penetration and that if deeper root penetration is needed, the subsequent freeze-thaw cycles of the upper portions of the subsoil would provide natural mitigation of any compacted areas of the right-of-way within 2 to 3 years. This differs from the FERC Plan, which specifies soil compaction testing to be performed in residential areas disturbed by construction and the appropriate mitigation measures to be implemented in severely compacted areas. While we recognize that the segregation or replacement of the topsoil would minimize compaction of the surface layer in residential areas, the compaction of subsoil layers could create drainage problems in the soils and restrict the root growth of various types of plants, including grasses under certain conditions. Because Algonquin has not provided adequate justification for deviating from the FERC Plan, **we recommend that:**

- **Algonquin should revise its E&SCP to include soil compaction testing and mitigation measures consistent with sections V.C.1 and V.C.3 of the FERC Plan. Algonquin should file the revised E&SCP with the Secretary for review and written approval by the Director of the Office of Energy Projects (OEP) <u>prior to construction</u>.**

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of contamination are typically minor because of the low frequency and volumes of spills and leaks. Algonquin's SPCC Plan identifies preventive measures to reduce the likelihood of a spill such as secondary containment for petroleum products, daily equipment inspection for leaks, and restrictions on the transport of potentially hazardous materials to the construction work area. The SPCC Plan also specifies measures to contain and clean up a spill should one occur (see Appendix G). Implementation of Algonquin's SPCC Plan would effectively reduce the potential impact on soils from spills of the hazardous materials used during construction.

Previously existing contaminated soils could be encountered at historic landfills and other hazardous waste sites during Project construction. A detailed discussion of hazardous waste sites that would be crossed by the pipeline routes and the measures Algonquin would implement to minimize potential impacts in the event contaminated soils are encountered is included in section 4.8.5.

Blasting activities associated with the occurrences of shallow bedrock can create a potential hazard to nearby structures. Algonquin has prepared a Blasting Plan to minimize the effects of blasting and ensure safety during blasting operations in areas of shallow bedrock (see Appendix K). All blasting techniques would comply with federal, state, and local regulations governing the safe storage, handling, firing, and disposal of explosive materials. Blasting is discussed further in section 4.1.3.5.

As discussed in section 2.5, Algonquin would employ full-time EIs to ensure compliance with its E&SCP, SPCC Plan, Blasting Plan, and other Project-specific plans and specifications during construction and restoration. At least one EI would be assigned to each construction spread. The EI would have the authority to stop work and order corrective actions for activities that violate the environmental conditions of the FERC Certificate and other authorizations.

4.2.3 NSTAR Alternative

The NSTAR Alternative would cross the same general soil types as the I-10 Extension and Q-1 System Replacement discussed above. The NSTAR Alternative would cross an additional 0.6 acre of soils susceptible to wind erosion and 0.2 acre of prime farmland soils than the corresponding segment of the proposed route. However, the NSTAR Alternative would cross less hydric soils, compaction-prone soils, stony/rocky soils, shallow-to-bedrock soils, and soils with revegetation concerns. The acreage difference between the NSTAR Alternative and the corresponding segment of the proposed route is less than 1.0 acre for all of the soil characteristics examined and would, therefore, not represent a substantial increase or decrease in soil impacts relative to the entire Project's impact.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Existing Groundwater Resources

Groundwater resources in the Project area include unconsolidated sand and gravel aquifers underlain by crystalline bedrock aquifers. The sand and gravel aquifers primarily comprise ice-contact, outwash, and lake-bottom sediments that were deposited in pre-glacial bedrock valleys and water-filled depressions. Water wells in the sand and gravel aquifers typically range in depth between 10 and 100 feet and yield between 10 and 1,000 gallons per minute (gpm). The quality of water is adequate for most uses, but may contain high concentrations of iron and manganese (USGS, 1995). In general, groundwater within these aquifers follows topographic contours and discharges to surface waterbodies.

Crystalline bedrock aquifers are formed of igneous and metamorphic rocks with very low water transmission rates and generally small water storage capacity. Water wells in the crystalline bedrock aquifers range in depth between 100 and 400 feet and yield between 1 to 25 gpm, primarily from joints, fractures, faults, and bedding planes. The groundwater quality from the crystalline bedrock aquifers is generally suitable for most uses but may cause corrosion of pipes and appliances (USGS, 1995).

4.3.1.2 Sole Source Aquifers

The EPA defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. All designated sole or principal source aquifers are referred to as "sole source aquifers." In Massachusetts, one sole source aquifer would be crossed by the Project, the Head of the Neponset sole source aquifer (EPA, 2007a). The Head of the Neponset sole source aquifer would be crossed by the Q-1 System Replacement twice in the Town of Sharon, Massachusetts (MPs 12.2 to 13.1 and MPs 13.5 to 14.4). This sole source aquifer supplies roughly 68 percent of the drinking water in the area, which includes the Towns of Foxboro, Medfield, and Walpole and portions of Dover, Norwood, Sharon, and Westwood. The Project would not cross any sole source aquifers in Connecticut.

4.3.1.3 State Designated Aquifers

Massachusetts

The MassDEP designates any aquifer that has been delineated as medium or high yield by the USGS as a Potentially Productive Aquifer (PPA) (310 Code of Massachusetts Regulations (CMR) 40.0006). Based on Algonquin's review of available MassGIS data, the proposed Project would cross PPAs 11 times, all of which would be within the Boston Harbor major surface water basin. Two of the 11 PPAs occur along the I-10 Extension and 9 occur along the Q-1 System Replacement. Table 4.3.1-1 summarizes the milepost range and USGS well yield classification of these PPAs.

Two percent of the I-10 Extension and 13 percent of the Q-1 System Replacement would be underlain by PPAs. The Rehoboth Compressor Station site would not be underlain by any mapped PPAs.

TABLE 4.3.1-1

Potentially Productive Aquifers Crossed by the HubLine/East to West Project

State/Facility/Major Surface Water Basin	Approximate Milepost Range	USGS Well Yield Classification (gallons per minute)	Approximate Depth to Groundwater (feet)
Massachusetts			
I-10 Extension			
Boston Harbor Basin	7.3 – 7.4	100 – 300	7 – 14.5 [a]
	7.9 – 8.1	100 – 300	7 – 14.5 [a]
Q-1 System Replacement			
Boston Harbor Basin	15.3 – 15.4	100 – 300	7 – 14.5 [a]
	15.4 – 15.5	> 300	7 – 14.5 [a]
	15.5 – 15.6	100 – 300	7 – 14.5 [a]
	17.7 – 17.7	100 – 300	7 – 14.5 [a]
	17.7 – 17.8	> 300	7 – 14.5 [a]
	17.8 – 17.9	100 – 300	7 – 14.5 [a]
	18.9 – 19.0	100 – 300	7 – 14.5 [a]
	19.0 – 19.2	> 300	7 – 14.5 [a]
	19.2 – 19.4	100 – 300	7 – 14.5 [a]
Rehoboth Compressor Station	- None -		
Connecticut [b]			
E-3 System Replacement			
Thames Basin	6.1 – 6.5	3 – 6,900 [c]	1.9 – 17.4 [d]
	7.7 – 11.1	3 – 6,900 [c]	1.9 – 17.4 [d]

[a] Based on groundwater monitoring well data for Weymouth (Morrison et al., 2005).
[b] Aquifers listed are areas where the groundwater quality is designated GAA.
[c] Based on range of average yields reported for the state.
[d] Based on groundwater monitoring well data for North Stonington, Connecticut (Morrison et al., 2005).
Source: MassGIS, 2007a.

Connecticut

Connecticut Water Quality Standards provide a groundwater quality classification scheme that differentiates groundwater by designated use and discharge restrictions. About 65 percent of the E-3 System Replacement would be located within groundwater quality class GA, which is given to areas where existing private and potential public or private supplies of water suitable for drinking without treatment are present. The E-3 System Replacement would also cross two areas classified as GAA. Although not defined as a state aquifer, areas classified as GAA are important because they have been specifically classified by the state as having useable water. The designated groundwater use of GAA classified areas is as an existing or potential public supply of water suitable for drinking without treatment. The two GAA classified areas are located between MPs 6.1 and 6.5 and MPs 7.7 and 11.1, with a total crossing length of 3.8 miles, or 35 percent of the E-3 System Replacement (see table 4.3.1-1).

4.3.1.4 Wellhead and Aquifer Protection Areas

Wellhead Protection Areas (WPAs) are established through state wellhead protection programs as required by the Safe Drinking Water Act. WPAs are delineated around a public water supply well or well field on the basis of groundwater travel times. The CTDEP refers to wellhead protection areas as Aquifer Protection Areas (APAs).

Table 4.3.1-2 identifies WPAs/APAs that would be crossed by the proposed Project.

TABLE 4.3.1-2

Wellhead and Aquifer Protection Areas Crossed by the HubLine/East to West Project

State/Facility/Municipality	Approximate Milepost Range	Water Supply	Approximate Crossing Length (feet)
Massachusetts			
I-10 Extension		- None -	
Q-1 System Replacement			
Sharon	12.2 – 12.4	Walpole Water Department	792
Sharon	14.8 – 15.0 15.1 -15.2 15.3 – 15.6	Sharon Department of Public Works and Canton Water and Sewer Division (2003)	3,168
Rehoboth Compressor Station		- None -	
Connecticut			
E-3 System Replacement		- None -	

Source: MassGIS, 2007b.

As shown in table 4.3.1-2, two WPAs would be crossed by the Project in Massachusetts and no APAs would be crossed in Connecticut. Both of the WPAs crossed in Massachusetts are designated as Zone II, or the protected recharge area for a well, which is defined as that area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions. The WPA crossings would occur along the Q-1 System Replacement between approximately MPs 12.2 and 12.4 and MPs 14.8 and 15.6 and would be approximately 792 feet and 3,168 feet in length, respectively. There are no WPAs in the vicinity of the Rehoboth Compressor Station site.

4.3.1.5 Water Supply Wells and Springs

Algonquin conducted a review of the available GIS data from the MassDEP's Water Quality Testing System and the CTDEP's geospatial data for public supply wells in designated APAs (Massachusetts Surface Water Quality Standards Program, 1995; CTDEP, 2000) to determine if any public water supply wells would be located within 150 feet of the construction work area. Additionally, Algonquin has consulted landowners regarding the locations of private wells and springs on their properties. Through field surveys, Algonquin is verifying the locations of all wells and springs within 150 feet of the construction work area. Table 4.3.1-3 lists the water supply wells and springs identified to date.

As shown in table 4.3.1-3, 14 private, water supply wells were identified within 150 feet of the Project. Of these, six are along the I-10 Extension construction work area and eight are along the E-3 System Replacement. To date, Algonquin has not identified any private wells within 150 feet of the construction work area for the Q-1 System Replacement or the proposed Rehoboth Compressor Station site. Additionally, Algonquin has not identified any public water supply wells or springs within 150 feet of the construction work area for any of the Project facilities.

TABLE 4.3.1-3

Water Supply Wells and Springs within 150 feet of the Construction Work Area Associated with the HubLine/East to West Project [a]

State/Facility/Municipality	Supply Type	Approximate Milepost	Approximate Distance from Pipeline (feet)	Approximate Distance from Construction Work Area (feet)
Massachusetts				
I-10 Extension				
Randolph	Private	8.0	207	138
Randolph	Private	8.1	207	130
Randolph	Private	8.1	262	136
Randolph	Private	8.1	93	58
Randolph	Private	9.2	64	30
Randolph	Private	9.2	51	1
Q-1 System Replacement		- None -		
Rehoboth Compressor Station		- None -		
Connecticut				
E-3 System Replacement				
Norwich	Private	0.2	72	22
Norwich	Private	0.4	72	22
Norwich	Private	0.8	64	38
Norwich	Private	1.2	106	65
Norwich	Private	2.0	68	42
Preston [b]	Private	3.9	173	47
Preston	Private	5.6	53	3
Preston	Private	5.6	32	6

[a] Algonquin is continuing to conduct field surveys to collect well and spring location information and would file final information on the locations of wells and springs when surveys are complete.

[b] The existing pipeline would be abandoned in place between MPs 2.9 and 4.1; therefore, no impacts on this private well are expected.

Comments were received expressing concern that the proposed I-10 Extension could adversely affect groundwater in proximity to Cranberry Pond (MP 5.7), which could potentially jeopardize municipal water supplies in nearby communities including Braintree, Weymouth, Holbrook, and Randolph, Massachusetts. The potential impacts of the Project on groundwater resources and the construction methods and mitigation measures that Algonquin would implement to minimize groundwater impacts are discussed in section 4.3.1.7. In addition, Algonquin is continuing to conduct field surveys to locate water supply wells and springs in proximity to the Project. To ensure that the proposed construction and mitigation measures are protective of nearby wells and springs, we are recommending in section 4.3.1.7 that Algonquin file the final field survey results prior to construction.

4.3.1.6 Potential Contaminated Groundwater

Algonquin reviewed federal, state, and local government databases and identified 145 potential and actual sources of groundwater contamination within 1,000 feet of the pipeline centerlines and within a 0.5-mile radius of the Rehoboth Compressor Station site. Based on a review of these databases, the I-10 Extension would be located within 1,000 feet of 76 sites, the Q-1 System Replacement would be located within 1,000 feet of 64 sites, and the E-3 System Replacement would be located within 1,000 feet of 5 sites. No contaminated or potentially contaminated sites were identified within a 0.5-mile radius of the Rehoboth Compressor Station.

Algonquin conducted additional file reviews at the MassDEP and CTDEP and identified seven sites with a higher likelihood of encountering contaminated groundwater near the Project facilities. Of these, three are located along the I-10 Extension, three are located along the Q-1 System Replacement, and one is located along the E-3 System Replacement. Additional discussion of hazardous waste sites is included in section 4.8.5.

4.3.1.7 General Impact and Mitigation

Pipeline construction activities are not likely to significantly impact groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. The depth to groundwater in the majority of the Project area aquifers averages 7 to 14.5 feet, and would generally be below the trench excavation depth. However, shallow aquifers could sustain minor, indirect impacts from changes in overland water flow and recharge caused by clearing and grading of the proposed right-of-way. In addition, near-surface soil compaction caused by heavy construction vehicles could reduce the soil's ability to absorb water in these isolated areas. During construction, local water table elevations could be affected by trenching and backfilling, which could temporarily impact wells in close proximity to the construction area. In areas where groundwater is near the surface, trench excavation may intersect the water table in low-lying areas. These minor, direct and indirect impacts would be temporary and would not significantly affect groundwater resources. These potential impacts would be avoided or further minimized by the use of construction techniques contained in Algonquin's E&SCP (see Appendix F), such as the use of temporary and permanent trench plugs and interceptor dikes. In instances where trench dewatering would be required, all trench water would be discharged into well-vegetated upland areas or properly constructed dewatering structures to allow the water to infiltrate back into the ground, thereby minimizing any long-term impacts on the water table. Upon completion of construction, Algonquin would mitigate compacted soils, restore the ground surface as closely as practicable to original contours, and revegetate the right-of-way to ensure restoration of preconstruction overland flow and recharge patterns. Furthermore, the area of soil compaction would be small compared to the total recharge area. Additional discussion of soil compaction and mitigation is presented in section 4.2.

Unconfined aquifers and shallow groundwater areas could be vulnerable to contamination caused by inadvertent surface spills of hazardous materials used during construction. Accidental spills and leaks of hazardous materials associated with equipment trailers; the refueling or maintenance of vehicles; and the storage of fuel, oil, and other fluids pose the greatest risk to groundwater resources. If not cleaned up, contaminated soils could continue to leach and add pollutants to groundwater long after a spill has occurred. Impacts associated with spills or leaks of hazardous liquids would be avoided or minimized by restricting the location of refueling and storage facilities and by requiring cleanup in the event of a spill or leak.

Implementation of the measures in Algonquin's SPCC Plan would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials or petroleum (see Appendix G). The SPCC Plan identifies preventive measures to reduce the likelihood of a spill such as secondary containment for petroleum products, daily equipment inspection for leaks, and restrictions on the transport of potentially hazardous materials to the construction work area. The SPCC Plan also specifies measures to contain and clean up a spill should one occur.

As specified in Algonquin's SPCC Plan, no hazardous materials would be stored and no refueling would occur within 100 feet of wetlands or waterbodies. The SPCC Plan does not specify restrictions on refueling near private or public water supply wells. Therefore, to minimize the potential for an inadvertent spill of fuel to impact nearby wells, **we recommend that:**

- **Algonquin should revise its SPCC Plan to prohibit refueling within 200 feet of any private water supply well and 400 feet of any public water supply well. Algonquin should file the revised SPCC Plan with the Secretary for review and written approval by the Director of OEP <u>prior to construction</u>.**

Implementation of Algonquin's revised SPCC Plan would adequately address the storage and transfer of hazardous materials and petroleum products, and the response to be taken in the event of a spill. Therefore, the potential for the Project to contaminate local aquifers or water supply wells would be minimal.

Previously existing contaminated groundwater could be encountered at historic landfills and other hazardous waste sites during Project construction. A detailed discussion of hazardous waste sites that would be crossed by the pipeline routes and the measures Algonquin would implement in the event contaminated groundwater is encountered is included in section 4.8.5.

Blasting activities associated with the occurrence of shallow bedrock can create a potential hazard to nearby water supply wells. Where blasting is necessary, it would be done in accordance with Algonquin's Blasting Plan (see section 4.1.3.5 and Appendix K). If blasting is required near water supply wells, blasting loads would be reduced as much as possible. In addition, Algonquin would conduct pre- and post-construction testing of all existing private water supply wells within 150 feet of the construction work area. If blasting or construction activities temporarily impair the quality or yield of a water supply well, Algonquin would either provide a temporary source of water (e.g., bottled) to residents until the damaged water well is restored to its former capacity and quality or compensate the landowner for the damages. If the water is used for farming or livestock operations, temporary water would be trucked from a municipal water source until the water supply well is repaired or replaced. In the unlikely event that water quality or yield is permanently impaired as a result of blasting or other construction activities based on post-construction testing, Algonquin would arrange for the water supply well to be repaired or replaced. To ensure final well and spring locations are identified prior to construction and that proposed mitigation measures are appropriate, **we recommend that:**

- **<u>Prior to construction</u>, Algonquin should file with the Secretary the field verified locations, by milepost, of all water supply wells and springs within 150 feet of construction work areas. <u>Within 30 days of placing the facilities in service</u>, Algonquin should file a report with the Secretary discussing whether any complaints were received concerning well yield or water quality and how each was resolved.**

In addition to the mitigation measures outlined above, Algonquin would install post-construction stormwater management measures at the Rehoboth Compressor Station to treat the difference in stormwater runoff volume from pre- to post-construction conditions. These stormwater management measures could potentially modify the location and discharge areas and percolation rates. However, Algonquin anticipates that new impervious and graveled surfaces required for this facility would be minor compared to the mostly undeveloped area surrounding the compressor station site. Therefore, it is unlikely that construction and operation of this facility would result in a significant change in groundwater recharge outside of the compressor station boundaries. Algonquin would also install onsite septic systems at the Rehoboth Compressor Station for the treatment of domestic wastewater, and hazardous materials storage would be designed to applicable engineering, safety, and environmental standards. The site would also include leak detection and spill containment structures designed to handle the quantity of materials stored and would be maintained in compliance with all applicable regulations and permits. By designing and operating these systems in compliance with applicable regulations, and by

implementing other provisions of Algonquin's SPCC Plan, the potential for the proposed compressor station to significantly impact groundwater quality would be minimal.

The pipe storage and contractor ware yards and access roads proposed as part of the Project are located in the same general Project vicinity as the pipeline routes discussed above. The measures Algonquin would implement to minimize impacts on groundwater as a result of the Project (e.g., adherence to the measures included in its E&SCP and SPCC Plan) would apply to these facilities as well. Therefore, use of the pipe storage and contractor ware yards and access roads would not be expected to impact groundwater resources.

4.3.2 Surface Water Resources

Waterbodies along the proposed pipeline routes were identified using Algonquin's aerial photo-based alignment sheets, USGS topographic maps, and field surveys conducted in 2007 and 2008. Table 4.3.2-1 lists the waterbodies that would be crossed by name, location, crossing width, flow and fishery type, FERC classification, state water quality classification, and proposed crossing method. A total of 39 waterbodies, including 22 perennial waterbodies and 17 intermittent streams, would be crossed.

The CWA, section 305(b), requires states to review, establish, and revise water quality standards for all surface waters within the state. To comply with this requirement, each state has developed a classification system to describe the highest designated use(s) and associated water quality requirements of identified surface waters within the state. In addition, section 303(d) of the CWA requires states to develop a list of waterbodies where applicable surface water quality uses and standards are not attained and to list, by surface water segment, the pollutants or surface water characteristics that are not meeting surface water quality standards. The resulting section 303(d) List of Impaired Waters is used to establish priorities for water quality improvement measures, including development of total maximum daily load (TMDL). A TMDL is a planning document that establishes specific water quality goals and reduction estimates for pollutants currently exceeding surface water quality standards. Waterbodies remain on the section 303(d) List of Impaired Waters until the required TMDL are completed or new data show that the water quality uses and/or standards are being met.

4.3.2.1 Existing Surface Water Resources

Pipeline Facilities

Massachusetts – In Massachusetts, the proposed pipeline routes cross the Boston Harbor drainage basin (USGS, 2007a). Within this basin, the pipelines would cross waterbodies at 23 locations including 13 perennial waterbody crossings and 10 intermittent waterbody crossings. Perennial waterbodies flow during all seasons of the year and intermittent waterbodies flow only at certain times of the year. Fourteen of these waterbody crossings, including eight perennial and six intermittent waterbody crossings, occur along the I-10 Extension. The remaining nine waterbody crossings, including five perennial and four intermittent waterbody crossings, occur along the Q-1 System Replacement.

TABLE 4.3.2-1

Waterbodies Crossed by the HubLine/East to West Project [a]

State/Facility/ Milepost	Waterbody Name	Crossing Width (feet)	Flow Type (Perennial/ Intermittent/Tidal)	FERC Classification	Fishery Type [b]	State Water Quality Classification [c, d]	Proposed Crossing Method [e]
Massachusetts							
I-10 Extension							
0.0	Weymouth Fore River	3,597	Perennial/Tidal	Major	Coastal Marine [f] Estuarine	SB [f, g]	HDD
1.3	Unnamed Tributary to Cranberry Pond	3	Intermittent	Minor	Non-classified	B	Open Cut
3.9	Unnamed Stream	2	Intermittent	Minor	Non-classified	B	Open Cut
3.9	Unnamed Stream	3	Perennial	Minor	Non-classified	B	Open Cut
5.9	Unnamed Tributary to Cranberry Pond	4	Intermittent	Minor	Non-classified	A [h]	Open Cut
6.8	Tumbling Brook	2	Intermittent	Minor	Non-classified	A [h]	Open Cut
6.8	Unnamed Tributary to Tumbling Brook	5	Intermittent	Minor	Non-classified	A [h]	Open Cut
7.3	Unnamed Tributary to Tumbling Brook	4	Perennial	Minor	Warmwater	A [h]	Open Cut
7.3	Unnamed Tributary to Tumbling Brook	3	Perennial	Minor	Non-classified	A [h]	Open Cut
7.9	Cochato River	60	Perennial	Intermediate	Warmwater	A [h]	Horizontal Bore
8.3	Mary Lee Brook	12	Perennial	Minor	Warmwater	A [h]	Open Cut
9.1	Unnamed Stream	10	Intermittent	Minor	Non-classified	B	Open Cut
9.6	Three Swamp Brook	4	Perennial	Minor	Warmwater	A [h]	Open Cut
11.8	Unnamed Perennial Stream	N/A	Perennial	Minor	Unknown	Unknown	Open Cut
Q-1 System Replacement							
13.9	Traphole Brook	7	Perennial	Minor	Significant Coldwater	B	Flume or Dam and Pump
14.1	Unnamed Stream	1	Intermittent	Minor	Non-classified	B	Open Cut
14.9	Unnamed Stream	13	Intermittent	Intermediate	Non-classified	B	Open Cut
15.8	Unnamed Tributary to Massapoag Brook	3	Intermittent	Minor	Warmwater	B	Open Cut
16.2	Massapoag Brook	20	Perennial	Intermediate	Warmwater	B	Flume or Dam and Pump
17.2	Steep Hill Brook	14	Perennial	Intermediate	Warmwater	B	Open Cut
17.4	Unnamed Tributary to Steep Hill Brook	5	Perennial	Minor	Warmwater	B	Open Cut

TABLE 4.3.2-1 (cont'd)

Waterbodies Crossed by the HubLine/East to West Project [a]

State/Facility/ Milepost	Waterbody Name	Crossing Width (feet)	Flow Type (Perennial/ Intermittent/Tidal)	FERC Classification	Fishery Type [b]	State Water Quality Classification [c, d]	Proposed Crossing Method [e]
18.9	Beaver Meadow Brook	25	Perennial	Intermediate	Unknown	B	Open Cut
19.5	Unnamed Stream	3	Intermittent	Minor	Warmwater	B	Open Cut
Connecticut							
E-3 System Replacement							
0.1	Unnamed Tributary to Norwichtown Brook	7	Intermittent	Minor	Non-classified	A	Open Cut
0.6	Norwichtown Brook	8	Perennial	Minor	Coldwater	A	Horizontal Bore
1.2	Unnamed Tributary to Bobbin Mill Brook	1	Intermittent	Minor	Non-classified	A	Open Cut
1.5	Bobbin Mill Brook	10	Perennial	Minor	Warmwater	A	Flume or Dam and Pump
2.8	Unnamed Stream	7	Perennial	Minor	Non-classified	A	Open Cut
2.9	Unnamed Stream	5	Intermittent	Minor	Non-classified	A	Open Cut
3.3	Hunter Brook	15	Perennial	Intermediate	Coldwater/ Diadromous	A	Flume or Dam and Pump
3.4	Hunter Brook	15	Perennial	Intermediate	Coldwater/ Diadromous	A	HDD
3.6	Shetucket River	800	Perennial	Major	Warmwater/ Diadromous	B	HDD
4.1	Unnamed Stream	2	Intermittent	Minor	Non-classified	A	Open Cut
4.7	Unnamed Stream	4	Intermittent	Minor	Non-classified	A	Open Cut
5.1	Unnamed Stream	2	Intermittent	Minor	Non-classified	A	Open Cut
7.4	Unnamed Stream	2	Intermittent	Minor	Non-classified	AA	Open Cut
8.5	Unnamed Stream	9	Perennial	Minor	Non-classified	A	Open Cut
8.6	Unnamed Stream	3	Perennial	Minor	Non-classified	A	Open Cut
9.3	Main Brook	17	Perennial	Intermediate	Warmwater/ Diadromous	AA	Flume or Dam and Pump

TABLE 4.3.2-1 (cont'd)

Waterbodies Crossed by the HubLine/East to West Project [a]

State/Facility/ Milepost	Waterbody Name	Crossing Width (feet)	Flow Type (Perennial/ Intermittent/Tidal)	FERC Classification	Fishery Type [b]	State Water Quality Classification [c, d]	Proposed Crossing Method [e]

[a] There are no waterbodies affected by the proposed Rehoboth Compressor Station or the associated suction/discharge lines. One waterbody (Massapoag Brook) would be crossed by an access road; however, the waterbody crosses under the road through a culvert and would not be affected.

[b] Fishery type classifications were determined through consultations with NOAA Fisheries, the MassDFW, the CTIFD, and electrofishing surveys conducted for the Massachusetts facilities. A "non-classified" designation indicates that a waterbody has not been classified by the fishery resource agency.

[c] State Designations and Use Descriptions

Massachusetts:

A - These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).

B –These waters are designated as habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated, they shall be suitable as a source of public water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

C- These waters are designated as habitat for fish, other aquatic life, and wildlife, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.

SB -These waters are designated as habitat for fish, other aquatic life, and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting with depuration (Restricted Shellfish Areas). These waters shall have consistently good aesthetic value.

Connecticut:

AA – These waters can be used as existing or proposed drinking water sources, habitat for fish and other aquatic life or wildlife, recreation, and industrial or agricultural water supply.

A – These waters are appropriate for fish, aquatic life and wildlife habitat, potential drinking water supply, recreation, navigation, and industrial or agricultural water supply.

B - These waters are appropriate for fish, aquatic life and wildlife habitat, recreation, navigation, and industrial or agricultural water supply.

[d] All waterbodies in Massachusetts not otherwise listed in the Massachusetts Water Quality Standards are designated as Class B and presumed High Quality.

[e] The proposed crossing methods are described in detail in section 2.3.2.

[f] Designated Warm Water according to Massachusetts Water Quality Standards.

[g] Designated Shellfishing according to Massachusetts Water Quality Standards.

[h] Designated Class A and Outstanding Resource Water as a tributary to a designated public water supply.

N/A = Not available.

The MassDEP Surface Water Quality Standards (314 CMR 4.00) for the waterbodies crossed in Massachusetts are listed in table 4.3.2-1. These standards define ORWs to include all Class A Public Water Supplies and their tributaries and any other waters specially designated by the MassDEP because of their outstanding socioeconomic, recreational, ecological, and/or aesthetic values. As indicated in 314 CMR section 4.06(3) and (2)(a), the ORW designation applies to the waterbody itself, associated tributaries, all bordering vegetated wetlands associated with the waterbody, and all Massachusetts certified vernal pools under Massachusetts Surface Water Quality Standards. Eight of the waterbodies crossed in Massachusetts are designated as ORWs. Additional information on bordering vegetated wetlands and vernal pools is provided in sections 4.4.2 and 4.6.1.4, respectively.

Connecticut – In Connecticut, the E-3 System Replacement would cross the Thames River major drainage basin (CTDEP, 2008). Within this basin, the pipeline would cross waterbodies at 16 locations including 9 perennial waterbody crossings and 7 intermittent waterbody crossings. The CTDEP Surface Water Quality Standards (Connecticut General Statute (CGS) section 22a-426) for these waterbodies are listed in table 4.3.2-1.

Aboveground Facilities and Pipe Storage and Contractor Ware Yards

No waterbodies are present at any of the aboveground facility sites or proposed pipe storage and contractor ware yards.

Access Roads

One waterbody would be crossed by access roads associated with the Project. This waterbody is Massapoag Brook, a 10-foot-wide perennial stream that would be crossed in Massachusetts by access road TAR 16.05 (this waterbody is also crossed by the Q-1 System Replacement at MP 16.2).

4.3.2.2 General Impact

Pipeline construction could affect surface waters in several ways. Clearing and grading of streambanks, in-stream blasting and trenching, trench dewatering, and backfilling could affect waterbodies through modification of existing aquatic habitat, an increased rate of in-stream sediment loading, increased turbidity levels, reduced dissolved oxygen concentrations, stream warming, and introduction of chemical discharges from fuels/lubricants.

The clearing and grading of the waterbody banks associated with non-HDD crossings would disturb the riparian vegetation and soils, exposing the site(s) to erosion/deposition. Heavy equipment used during construction could compact upland and riparian soils, which could greatly reduce infiltration and cause greater runoff to waterbodies. Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters and spills from equipment working in waterbodies could create a potential for contamination, which, if a spill were to occur, could degrade downstream water quality and aquatic habitat.

The greatest potential impacts of pipeline construction on surface waters would result from an increase in sediment loading to surface waters and an increase in internal sediment loading due to channel/floodplain instability as a result of a change in erosion/deposition patterns. The level of impact of the proposed Project on surface waters would depend on precipitation events, sediment loads, stream area/velocity, channel integrity, and bed material.

The highest levels of sediment would be generated by use of the wet open-cut method, which Algonquin plans to use for 29 of the 39 proposed waterbody crossings. The amount of sediment would

depend on the characteristics at the crossing location including depth and width of the stream, which affects mixing of the sediment plume in the water column; current velocity and local turbulence at and downstream of the crossing location; concentrations of suspended sediment initially at the crossing location and at some distance downstream; particle diameter; specific weight; and settling velocity of the excavated and backfilled materials (Ritter, 1984; Reid et al., 2004). The highest peak of turbidity usually occurs during trench excavation and backfilling. These peaks decline rapidly when the streambed disturbance ceases (Reid and Anderson, undated). Twenty-nine of the 39 waterbodies crossed by the pipeline routes are 10 feet wide or less at the crossing location.

Less sediment would be generated where dry crossing methods (e.g., flume or dam and pump) are employed and direct sediment impacts would be entirely avoided where the HDD method or horizontal bore method is used. Where the flume or dam and pump methods are used, temporary construction-related impacts would be limited primarily to short periods of increased turbidity before installation of the pipeline during the installation of the upsteam and downstream dams, and following installation of the pipeline when the dams are pulled and flow across the restored work area is re-established.

The impact of access roads on the waterbodies they cross would depend on the condition of the access road at the time of construction, the width and depth of the waterbody at the crossing, the timing of construction (e.g., anticipated potential for rainfall events), and the anticipated use of the road (e.g., use for heavy construction equipment or for access to the right-of-way by pickup trucks).

Long-term impacts associated with pipeline operations and maintenance would be relatively minor and limited to periodic clearing of the vegetation within the permanent right-of-way at waterbody crossings. These maintenance activities would follow the measures outlined in Algonquin's E&SCP, which are consistent with the measures outlined in the FERC Procedures.

Several federal and state agencies regulate construction activities within waterbodies, including the COE, the EPA, the MassDEP, and the CTDEP. Algonquin would construct all waterbody crossings in accordance with the requirements of these permitting agencies. The general procedures that Algonquin would implement to avoid or minimize potential impacts on surface waters are discussed below. In Massachusetts and Connecticut, section 401 Water Quality Certification would be required from the MassDEP and the CTDEP, respectively.

4.3.2.3 Waterbody Construction and Mitigation Procedures

A detailed discussion of the waterbody construction procedures that Algonquin is proposing to use is included in section 2.3.2. As discussed above, the majority of waterbodies that would be crossed are expected to be less than or equal to 10 feet wide at the water's edge and many of these may be dry at the time of construction, which would significantly reduce the potential impacts described above.

During construction across waterbodies, Algonquin would implement the mitigation measures described in its E&SCP. All trench spoil would be returned to the trench, and all disturbed areas would be restored to preconstruction contours.

Some of the relevant mitigation measures pertaining to waterbody crossings that are specified in Algonquin's E&SCP include:

- using the HDD crossing method and developing site-specific construction procedures for the Weymouth Fore and Shetucket Rivers, which are greater than 100 feet wide at the crossing location (see section 4.3.2.4);

- using horizontal boring, or other dry crossing techniques at sensitive waterbodies (see section 4.3.2.7);

- locating extra workspaces at least 50 feet back from waterbody boundaries unless a reduced setback is requested on a site-specific basis and a variance is issued by the FERC (see section 4.3.2.9);

- requiring temporary erosion and sediment control measures to be installed across the entire width of the construction right-of-way after clearing and before ground disturbance to prevent the flow of spoil or heavily silt-laden water into any waterbody;

- maintaining adequate flow rates throughout construction to protect aquatic life and prevent the interruption of existing downstream uses;

- designing and maintaining equipment bridges to prevent soil from entering the waterbody and minimize impacts on the channel bottom and banks;

- restricting spoil placement near surface waters to the construction right-of-way at least 10 feet from the water's edge or in additional extra workspaces placed at least 50 feet from the water's edge;

- mitigating the duration and degree of sedimentation and turbidity by requiring construction to be completed across minor waterbodies (i.e., waterbodies less than or equal to 10 feet wide) within 24 hours and across intermediate waterbodies (i.e., waterbodies greater than 10 feet wide but less than or equal to 100 feet wide) within 48 hours (not including blasting and other rock breaking measures);

- requiring maintenance of temporary erosion and sediment control measures throughout construction until streambanks and adjacent upland areas are stabilized;

- routinely inspecting tanks and storage areas for leaks; prohibiting use of leaking equipment; and storing fuel, lubricants, and hazardous materials in upland areas at least 100 feet from waterbodies and wetlands;

- prohibiting refueling or lubricating of vehicles or equipment within 100 feet of a waterbody, except where absolutely necessary;

- responding quickly to leaks and spills by implementing the containment, countermeasure, and cleanup measures outlined in the SPCC Plan;

- returning all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;

- at wet open-cut crossings, requiring stabilization of the waterbody banks and installation of temporary sediment barriers within 24 hours of completing in-stream construction activities;

- at dry crossings, requiring that waterbody bank stabilization be completed before returning flow to the waterbody channel;

- installing temporary sediment barriers at the base of slopes adjacent to waterbody crossings; and

- revegetating streambanks quickly in accordance with the E&SCP and any other applicable agency requirements.

The CTDEP has recommended implementing special stream restoration at one location, Main Brook, located at MP 9.3 along the E-3 System Replacement. Because the stream channel and banks along this waterbody are composed of very soft sediments (sand/muck), the CTDEP recommended that the stream channel be armored with a heterogeneous mixture of gravels and cobbles to facilitate streambed restoration after construction (CTDEP, 2007). The CTDEP also recommended that the streambanks be armored with small rock to protect from erosion after the pipeline is installed (CTDEP, 2007). Algonquin would implement these additional protective stream restoration measures at the Main Brook crossing.

Access road TAR 16.05, which crosses Massapoag Brook in Massachusetts, is an existing dirt/fill road that is currently used to provide access to the NSTAR powerline right-of-way. Massapoag Brook crosses under this access road through a culvert. Algonquin anticipates that minor maintenance/grading of this road may be required during construction to allow for safe passage of equipment. Timber matting may also be used at Massapoag Brook to provide additional support for heavy equipment over the culvert. It is not expected that any of these temporary improvements would significantly impact the waterbody or the wetlands adjacent to Massapoag Brook. Algonquin would implement measures outlined in its E&SCP to minimize impacts associated with erosion and sedimentation across this waterbody crossing. Additionally, Algonquin would restore the access road to its preconstruction condition, unless otherwise authorized by the landowner.

4.3.2.4 Major Waterbodies

The E2W Project would cross two major waterbodies, the Weymouth Fore River from MPs 0.0 to 1.2 along the I-10 Extension in Massachusetts and the Shetucket River from MPs 3.4 to 3.9 along the E-3 System Replacement in Connecticut. Algonquin is proposing to cross both of these major waterbodies using the HDD method. The second crossing of Hunter Brook located at MP 3.4 along the E-3 System Replacement would be included as part of the HDD of the Shetucket River.

As discussed in section 2.3.2 and depicted on figure 2.3.2-5, the HDD method is a specialized crossing method that typically avoids direct impacts on waterbodies and riparian areas. Disturbance between HDD entry and exit points would be limited to selective clearing of small trees and scrub-shrub vegetation to allow for the placement of guide lines needed for the drill alignment and activities necessary to implement the HDD Contingency Plan (see discussion below). Algonquin would not perform any vegetation maintenance in these areas to support the operation of the new pipeline.

The HDD method requires suitable geology, topography, and space to accommodate the bending radius of the pipe. This technique involves drilling a pilot hole under the waterbody and banks, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe. Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring non-toxic materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry is referred to as drilling mud. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the river and then pulled through the drilled hole.

The Weymouth Fore River is approximately 3,597 feet wide at the proposed crossing location. The Weymouth Fore River is considered sensitive because it is classified as impaired under Massachusetts water quality standards and is designated as essential fish habitat (EFH) for winter flounder. The length of the drill would be approximately 6,487 feet and the drill would be 80 feet below the riverbed at its deepest point.

The Shetucket River is approximately 800 feet wide at the proposed crossing location. The river is considered sensitive because it is part of a protected National Heritage Corridor and is designated EFH for Atlantic salmon (see sections 4.6.2.3 and 4.6.2.4). The length of the drill would be approximately 2,034 feet and the drill would be 40 feet below the riverbed at its deepest point.

There are certain subsurface material characteristics that may prevent successful HDD installations. These include large grain content (i.e., gravel, cobbles, and boulders) and excessive rock strength and hardness. Where soils consist principally of coarse-grained material, they cannot be readily fluidized by the drilling mud, nor are they stable enough to be cut and removed in a drilling mud stream as is the case with a crossing in competent rock. Where a boulder or cobble occurs in the drill path, it can present an obstruction to the bit, reamer, or pipeline or coarse material may migrate to low spots along the drill path forming impenetrable blocks. Exceptionally strong and hard rock can also hamper all phases of an HDD. Excessive rock hardness can lead to slow penetration rates due to frequent stoppages to replace worn bits and reamers, tool failures downhole resulting from premature wear, and drill pipe failures due to excessive torque.

In May, June, and August of 2008, Algonquin conducted geotechnical investigations at the crossing locations for the Weymouth Fore and Shetucket Rivers to determine the subsurface conditions. The results indicate that the geologic units at the Weymouth Fore River crossing location generally consist of sand, gravel, clay, and glacial till overlying bedrock comprising argillite, a very fine-grained sedimentary rock, or granite, a crystalline igneous rock. The geologic units at the Shetucket River crossing location generally consist of sand, gravel, and glacial till overlying a metamorphic schist bedrock. The majority of the length of both HDDs would occur within the bedrock units at each location, likely resulting in successful HDD installations.

The primary impact that could occur as a result of an HDD is an inadvertent release of drilling mud (frac-out) directly or indirectly into the rivers. Drilling mud may leak through previously unidentified fractures in the material underlying the riverbed, in the area of the mud pits or tanks, or along the path of the drill due to unfavorable ground conditions. Although drilling mud consists of naturally occurring nontoxic materials, such as bentonite clay and water, in larger quantities the release of drilling mud into a waterbody could affect fisheries or other aquatic organisms by settling in and temporarily inundating the habitats used by these species. The probability of an inadvertent release is greatest when the drill bit is working near the surface (i.e., near the entry and exit points). However, because the staging areas for the HDDs would be set back from the banks of the rivers, the potential for an inadvertent release to occur in the water would be minimized.

Algonquin has developed an HDD Contingency Plan (see Appendix I) that describes how the HDD operations would be conducted and monitored to minimize the potential for frac-outs as well as general procedures for cleanup of drilling mud releases and the procedures that would be followed if it is necessary to abandon the drill hole. These procedures are summarized below.

The most effective way to minimize the environmental impact associated with the release of HDD drilling mud is to maintain fluid circulation to the extent practical. Sediment barriers would be installed as necessary at the edge of the right-of-way, and between the drill pit and the waterbody being crossed. Clearing of existing vegetative cover at the HDD work areas would also be minimized to the

greatest extent practicable. Additionally, bales of hay, silt fence, and sand bags would be onsite as a backup in case a frac-out occurs at any point along the drill path in the upland areas.

If a frac-out were to occur in an accessible area, a containment structure made up of hay bales and silt fence would be erected around the frac-out return area. This initial containment attempt would be accomplished utilizing laborers without assistance from small mobile equipment. If the hand-constructed pit is not able to handle the mud volumes that are encountered, then a small sump pit may be excavated using a small rubber-tired backhoe or equivalent equipment in the area of the frac-out. Sand bags may be used to stabilize the pit walls. Drilling operations would continue, utilizing lower mud pressure and decreased mud volume, while still accomplishing penetration of the ground formation. Fluid from the drilling mud pit would be pumped to the entry point pit via a sump pump if returns were to continue to reach the pit. The frac-out site would then be monitored during drilling operations to ensure there is no migration of the drilling mud along the surface of the ground outside of the pit area.

Algonquin would clean up the drilling mud pit using a small rubber-tired backhoe and/or a wagon pulled by a small ORV. In the event that equipment cannot access the affected area, laborers would remove the material via wheel barrows or buckets, and the affected area would be leveled to its original contour.

If an in-water frac-out were to occur, the HDD operation would continue; however, the mud pressure and/or volume would be reduced to minimize the release. The cleanup operation would be performed after the HDD is completed and the pipe section for the crossing has been pulled under the river. The recovery method would involve the use of a barge outfitted with a vacuum truck or portable vacuum unit and, if necessary, divers. To increase visibility and the effectiveness of the cleanup, it would be conducted at the lowest possible tide level that still allows access by the barge. In accordance with its HDD Contingency Plan, Algonquin would notify the appropriate regulatory agencies within 8 hours of a frac-out. These agencies are listed in the HDD Contingency Plan (see Appendix I).

In the unlikely event that an HDD bore hole profile must be abandoned, Algonquin would also notify the appropriate regulatory agencies as outlined in the HDD Contingency Plan, and would implement one of the following alternate installation procedures:

- the pilot hole would be offset and drilled on a different profile from the same location;
- Algonquin would relocate the HDD to another location on the existing permanent easement; or
- Algonquin would acquire additional permanent easement to perform the HDD in an alternate location. The necessary clearance and permit amendments would be obtained prior to the initiation of this option.

In accordance with its E&SCP, Algonquin has submitted preliminary site-specific HDD crossing plans for the Weymouth Fore and Shetucket Rivers. We reviewed these plans and generally find them adequate. However, we determined that the HDD entry and exit point staging areas and other temporary extra workspaces depicted on the site-specific crossing plans differ from those depicted on the alignment sheets. Therefore, to clarify the HDD workspace requirements, **we recommend that:**

- **Algonquin should file final site-specific HDD crossing plans and alignment sheets that depict consistent construction work areas for the HDDs of the Weymouth Fore and Shetucket Rivers with the Secretary for review and written approval by the Director of OEP <u>prior to construction</u>.**

Although Algonquin's HDD Contingency Plan specifies how drilling mud would be disposed (i.e., in an authorized disposal site or provided to a landowner for spreading on agricultural fields), it does not specify the sources of water that would be used for mixing the drilling mud. Nor is this information included on the preliminary site-specific crossing plans. To ensure all Project-related surface water withdrawals are identified in consideration of potential impacts on aquatic resources and water quality, **we recommend that:**

- **Algonquin should revise its HDD Contingency Plan to specify the sources of water that would be used for the drilling mud at each proposed HDD crossing. Algonquin should file the revised HDD Contingency Plan with the Secretary for review and written approval by the Director of OEP <u>prior to construction</u>.**

Based on the subsurface conditions identified during Algonquin's geotechnical investigations, it appears that the HDDs are feasible; however, should one or both of the HDDs fail, Algonquin would meet with the appropriate permitting agencies to discuss the potential need to initiate the permitting process for an alternative crossing method of the river(s). In addition, **we recommend that:**

- **In the event of an unsuccessful HDD, Algonquin should file with the Secretary a plan for crossing the waterbody. This should be a site-specific plan that includes scaled drawings identifying all areas that would be disturbed by construction. Algonquin should file this plan concurrent with the submission of its application to the COE for a permit to construct using this plan. The Director of OEP must review and approve this plan in writing <u>before construction of the crossing</u>.**

4.3.2.5 Navigable Waterbodies

Pipeline installation in waters of the United States is regulated by the COE under section 10 of the Rivers and Harbors Act and section 404 of the CWA. Section 10 of the Rivers and Harbors Act prohibits the creation of any obstruction to the navigable capacity of any waters of the United States without specific approval of the COE. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States. The Project would cross two navigable waters, the Weymouth Fore River in Massachusetts and the Shetucket River in Connecticut. As discussed in section 4.3.2.4, Algonquin proposes to cross these two waterbodies using the HDD method. Therefore, the Project would not create an obstruction to the navigable capacity of any waters of the United States.

4.3.2.6 Designated Port Areas/Coastal Zone Management Areas

Pipeline installation across Designated Port Areas (DPA) would be subject to review through the MassDEP Chapter 91(21), the MassCZM, and the Federal Consistency Review Process. Approximately 200 linear feet of the I-10 Extension would be located within the offshore portion of the Weymouth Fore River DPA between MPs 0.0 and 0.04. This is in an area that would by crossed by the HDD, and the pipeline would be far below the riverbed; consequently, the DPA would not be impacted by the pipeline. The Shetucket River crossing of the E-3 System Replacement is located outside of the Coastal Boundary as defined in CGS section 22a-94(b), and because the Project area is located outside of the Coastal Boundary, a coastal consistency review would not be required in accordance with the Connecticut Coastal Management Act. A detailed discussion of Coastal Zone Management Areas is included in section 4.8.4.1.

4.3.2.7 Sensitive Waterbodies

Waterbodies may be considered sensitive to pipeline construction for a number of reasons, including, but not limited to: the width of the crossing; waters that do not meet the water quality

standards associated with the water's designated beneficial uses; surface waters that have been designated for intensified water quality management and improvement; waterbodies that contain threatened or endangered species or critical habitat; waters that support fisheries of special concern; waterbodies that are crossed near a surface water intake; waterbodies that are designated as ORW; waterbodies that are associated with certified vernal pools; and rivers on or designated to be added to the Nationwide Rivers Inventory (NRI) or a state river inventory. Other factors that can provide the basis for sensitivity include waterbodies located in sensitive and protected watershed areas; waterbodies and intermittent drainages that have steep banks, potentially unstable soils, high volume flows, and actively eroding banks; and surface waters that have important riparian areas. Table 4.3.2-2 lists sensitive waterbodies that would be crossed by the Project.

Five of the waterbody crossings along the I-10 Extension and Q-1 System Replacement occur in areas identified as impaired on the Massachusetts 303(d) list. These include the Weymouth Fore River and Cochato Rivers along the I-10 Extension and the Traphole, Massapoag, and Beaver Meadow Brooks along the Q-1 System Replacement. The Weymouth Fore and Cochato Rivers would be crossed using the HDD and horizontal bore methods, respectively, and would not be directly affected by construction. Traphole and Massapoag Brooks would be crossed using a dry crossing technique. This crossing method isolates the area of impact on the construction right-of-way and thus would substantially avoid or minimize increased water turbidity or sedimentation of downstream habitats. Beaver Meadow Brook would be crossed using the open-cut method. Access Road TAR 16.05 along the Q-1 System Replacement would also cross Massapoag Brook. General impacts resulting from this crossing method and mitigation to minimize these effects are described in sections 4.3.2.2 and 4.3.2.3.

The Project would cross eight waterbodies that have been designated as ORWs because they are tributaries to designated public water supplies. All of these ORWs are located along the I-10 Extension in Massachusetts. The ORW designation applies to the waterbody itself as well as to all bordering vegetated wetlands and associated tributaries. Seven of these ORWs would be crossed by the open-cut crossing method. General impacts on these waterbodies and the mitigation measures that would be employed to minimize these effects are described in sections 4.3.2.2 and 4.3.2.3. As discussed above, the Cochato River would be crossed using the horizontal bore method and, therefore, would not be directly affected by construction.

All certified vernal pools are considered ORWs under the Massachusetts Surface Water Quality Standards. Vernal pool surveys were conducted during the spring of 2007 and 2008 where survey access was granted. A detailed discussion of vernal pool resources is included in section 4.6.1.4. Algonquin will continue to consult with the MassDEP regarding the pipeline route within these ORWs and develop appropriate mitigation to ensure that impacts on these waterbodies are minimized.

No federal wild and scenic rivers would be crossed by the Project. However, the Shetucket River has been designated as part of the Quinebaug and Shetucket Rivers Valley National Heritage Corridor. The Shetucket River would be crossed using the HDD method and would not be directly affected by construction.

TABLE 4.3.2-2

Sensitive Waterbodies Crossed by the HubLine/East to West Project

State/Facility/ Waterbody I.D.	Waterbody Name	Milepost	Basis for Sensitivity	Detail
Massachusetts				
I-10 Extension				
Weymouth Fore River	Weymouth Fore River	0.3	Impaired; EFH	Listed impaired for: pathogens. EFH for winter flounder.
I-19-S1	Unnamed Tributary to Cranberry Pond	5.9	ORW	Tributary to Cranberry Pond/Cranberry Brook – designated ORW and tributary to public water supply.
I-27-S1	Tumbling Brook	6.8	ORW	Designated ORW - tributary to public water supply.
I-27A-S1	Unnamed Tributary to Tumbling Brook	6.8	ORW	Tributary to Tumbling Brook – designated ORW and tributary to public water supply.
I-31-S1	Unnamed Tributary to Tumbling Brook	7.3	ORW	Tributary to Tumbling Brook – designated ORW and tributary to public water supply.
I-31-S2	Unnamed Tributary to Tumbling Brook	7.3	ORW	Tributary to Tumbling Brook – designated ORW and tributary to public water supply.
I-33-S1	Cochato River	7.9	Impaired; ORW	Listed impaired for: pathogens, pesticides, and organic enrichment/low dissolved oxygen. Designated ORW - tributary to public water supply.
I-35-S1	Mary Lee Brook	8.3	ORW	Designated ORW - tributary to public water supply.
I-38-S1	Three Swamp Brook	9.6	ORW	Designated ORW - tributary to public water supply.
Q-1 System Replacement				
QB-7-S1	Traphole Brook	13.9	Impaired; FSC	Listed impaired for: pathogens. Significant coldwater fishery.
QB-12-S4	Massapoag Brook	16.2	Impaired	Listed impaired for: causes unknown and nutrients
QB-26-S1	Beaver Meadow Brook	18.9	Impaired	Listed impaired for: pathogens and organic enrichment/low dissolved oxygen
Connecticut				
E-3 System Replacement				
E3-S2	Norwichtown Brook	0.6	FSC	Coldwater fishery
E3-S50	Hunter Brook	3.3	FSC	Coldwater fishery
E3-S51	Hunter Brook	3.4	FSC	Coldwater fishery
E3-S9	Shetucket River	3.6	National Heritage Corridor; EFH	The Shetucket River is part of a protected National Heritage Corridor. EFH for Atlantic salmon.

ORW = Outstanding Resource Water
FSC = Fishery of Special Concern
EFH = Essential Fish Habitat

Six of the waterbodies that would be crossed by the Project support one or more fisheries of special concern. The Weymouth Fore and Shetucket Rivers provide EFH for winter flounder and Atlantic salmon, respectively. EFH is described in detail in section 4.6.2.4. Both of these waterbodies would be crossed using the HDD method and would not be directly affected by construction.

Four of the proposed waterbody crossings are in areas that have been designated coldwater fishery streams by the Massachusetts Division of Fisheries (MassDFW) and the Connecticut Inland Fisheries Department (CTIFD). One of these waterbodies, Norwichtown Brook at MP 0.6 along the E-3 System Replacement in Connecticut, would be crossed using the horizontal bore method and would not be directly affected by construction. The other two are the crossings of Traphole Brook at MP 13.9 along the Q-1 System Replacement in Massachusetts and Hunter Brook at MPs 3.3 and 3.4. The crossing of Traphole Brook and the first crossing of Hunter Brook (MP 3.3) would be accomplished using a dry crossing method. Algonquin has stated that it would install the pipeline across coldwater fisheries during the timing window outlined in its E&SCP, which would occur from June 1 through September 30. By constructing the pipeline during this time window, it would avoid the critical time of year when coldwater fishery species spawn and their fry occur in these waterbodies. The second crossing of Hunter Brook (MP 3.4) would be crossed as part of the HDD of the Shetucket River and would not be directly affected by construction.

According to the Massachusetts Natural Heritage and Endangered Species Program (MassNHESP), the MassDFW, and the CTDEP, no federally or state-listed fish species are known to occur in any of the waterbodies crossed within the Project area.

4.3.2.8 Public Watershed Areas

Public watershed areas include municipal watersheds and associated reservoirs as well as any state or locally designated surface water protection areas. Two surface water protection zones would be crossed by the I-10 Extension in Massachusetts. One of these areas occurs between MPs 9.5 to 10.9. The other surface water protection zone would be crossed twice, once between MPs 2.4 to 3.5, and a second time between MPs 4.2 to 5.0. No surface water protection zones would be crossed by the Q-1 System Replacement. The I-10 Extension and the eastern portion of the Q-1 System Replacement would be located within 3 miles of eight designated drinking water reservoirs (MassGIS, 2007c). The I-10 Extension would also cross eight waterbodies that are upstream tributaries to two of these reservoirs.

The E-3 System Replacement in Connecticut does not cross any surface water protection zones. However, it is located within 3 miles of 11 waterbodies designated as Class AA surface waters (CTDEP, 2002). Class AA waters are designated for existing or proposed drinking water supplies. Algonquin has initiated consultation with the Connecticut Department of Public Health (CTDPH) to determine which of these 11 waterbodies are designated as potable drinking water and would file updated information regarding surface water intakes and potable drinking water supplies within the Project area once consultations with the CTDPH have been completed.

Potential impacts on the areas crossed by the pipeline routes would be temporary and of short duration. Implementation of Algonquin's E&SCP and SPCC Plan would avoid or minimize environmental effects and there would be no long-term impacts on these areas due to construction and operation of the proposed facilities.

No public watershed areas would be affected by the Rehoboth Compressor Station.

4.3.2.9 Extra Workspaces Within 50 Feet of Waterbodies

The FERC Procedures stipulate that all temporary extra workspaces should be located at least 50 feet from waterbodies except where an alternative measure has been requested by the applicant and approved by the FERC. Algonquin identified certain areas where it believes site-specific conditions do not allow for a 50-foot setback of temporary extra workspace from waterbodies. Table 4.3.2-3 lists the locations of these areas and the reasons why Algonquin believes a reduced setback is justified. The table also includes our decision to approve or deny Algonquin's requests. Based on our review, it appears that the majority of Algonquin's requests are justified. However, we cannot approve Algonquin's request at four locations without additional justification. The first two locations are at the Weymouth Fore River, where Algonquin has requested very large workspaces for the HDD. We agree that extra workspace is needed within 50 feet of the river at this location but believe it would be possible to establish a buffer of undisturbed land between the river and the staging areas. At the third location, the temporary extra workspace appears to extend unnecessarily into Sylvan Lake. At the fourth location, we are unable to determine if the reduced setback near Hunter Brook is necessary because the filed drawings do not show the extent of the Shetucket River staging area relative to the adjacent brook.

Based on our review of Algonquin's alignment sheets, it appears that there are two other areas where Algonquin proposes to use temporary extra workspace within 50 feet of waterbodies but has not submitted a site-specific request. These areas are listed in table 4.3.2-4. If Algonquin proposes to use these areas as shown on the alignment sheets, it must submit a site-specific request and a site-specific explanation of the conditions that would not permit a 50-foot setback. These waterbodies also have associated wetlands for which a request to locate extra workspace within 50 feet of the wetland is needed (see table 4.4.3-2).

All of the extra workspaces listed in tables 4.3.2-3 and 4.3.2-4 are also listed in table E-1 in Appendix E and discussed in section 4.8.1. We are recommending in section 4.8.1 that Algonquin file additional justification for these extra workspaces with the Secretary during the draft EIS comment period.

TABLE 4.3.2-3

Areas Where Algonquin has Requested Temporary Extra Workspace Within 50 feet of Waterbodies

State/Facility/ Waterbody	Milepost	Size (feet (length by width))	Distance from Waterbody (feet)	Justification	Approval Status
Massachusetts					
I-10 Extension					
Weymouth Fore River	0.0	435 x 195	0	Staging area to support contractor mobilization/demobilization, installation of the proposed OPP Regulator Station and pig launcher, and the Weymouth Fore River horizontal directional drill (HDD) activities.	Additional Justification Needed
Weymouth Fore River	0.0	350 x 155	0	Staging area to support contractor mobilization/demobilization, installation of the proposed OPP Regulator Station and pig launcher, and the Weymouth Fore River HDD activities.	Additional Justification Needed
I-3-S1 [a]	1.3	1,465 x 65	0	Staging area for fabrication of the pullback section for the Weymouth Fore River HDD. This workspace is also within 50 feet of wetland I10-W3 (see table 4.4.3-1).	Approved
I10-27-S1 (Tumbling Brook) [a]	6.7	200 x 60	0	Needed for spoil/material storage for the North Franklin Street crossing. This workspace is also within 50 feet of wetland I10-W27 (see table 4.4.3-1).	Approved
Sylvan Lake [a]	7.8	205 x 140	0	Staging area for a wetland crossing, hydrostatic testing activities, and Centre Street. This workspace is also within 50 feet of a wetland bordering Sylvan Lake (see table 4.4.3-1).	Additional Justification Needed
Cochato River (I-33-S1) [a]	7.9	180 x 40	0	Staging area for the MBTA Railroad, Cochato River, and Mill Street crossings. This workspace is also within 50 feet of wetland I10-W33 (see table 4.4.3-1).	Approved
Q-1 System Replacement					
QB-15A-S1 [a]	17.4	280 x 65	5	Needed for spoil/material storage in a residential parking area and at a stream crossing. This workspace is also within 50 feet of wetland QB-1-15A (see table 4.4.3-1).	Approved
Connecticut					
E-3 System Replacement					
Norwichtown Brook (E3-S2) [a]	0.6	100 x 50	~15	Staging area for the Norwichtown Brook crossing and the Interstate 395 crossing. This workspace is also within 50 feet of wetland E3-W3 (see table 4.4.3-1).	Approved
Hunter Brook (E3-S5) [a]	3.4	HDD Staging Area	~25	Staging area for the Shetucket River HDD. This workspace is also within 50 feet of wetland E3-W50 (see table 4.4.3-1).	Additional Justification Needed

TABLE 4.3.2-3 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace Within 50 feet of Waterbodies

State/Facility/ Waterbody	Milepost	Size (feet (length by width))	Distance from Waterbody (feet)	Justification	Approval Status
E3-S14 [a]	7.4	200 x 25	~35	Needed for topsoil segregation in an agricultural field. This workspace is also within 50 feet of wetland E3-W28 (see table 4.4.3-1).	Approved
Avery Pond [a]	8.8	200 x 50	0	Staging area for a wetland crossing and access to hydrostatic test water source/testing activities. This workspace is also within 50 feet of wetland E3-W37 (see table 4.4.3-1).	Approved
Lake of Isles (Lake Nova) [a]	10.7	275 x 50	0	Staging area for access road entry and access to hydrostatic test water source/testing activities. This workspace is also within 50 feet of wetland E3-W3 (see table 4.4.3-1).	Approved

[a] These waterbodies also have associated wetlands for which a request to locate extra workspace within 50 feet of the wetland is needed (see table 4.4.3-1).

TABLE 4.3.2-4

Additional Areas Where Temporary Extra Workspaces are Located within 50 feet of Waterbodies

State/Facility/Wetland/ Waterbody Name, Location [a]	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Approval Status
Massachusetts				
I-10 Extension				
I-49-S3	3.8	380 x 50	0	Pending submittal of a site-specific request and justification.
Q-3 System Replacement				
QB-15A-S1	17.4	250 x 60	~30	Pending submittal of a site-specific request and justification.

[a] These temporary extra workspaces were identified during our review of alignment sheets as being within 50 feet of these waterbodies. These waterbodies also have associated wetlands for which a request to locate extra workspace within 50 feet of the wetland is needed (see table 4.4.3-2).

4.3.2.10 Groundwater and Surface Water Uses During Construction

Hydrostatic Test Water

Algonquin would verify the integrity of the pipelines before placing them into service by conducting a series of hydrostatic tests. These tests involve filling the pipeline with water, pressurizing it, and then checking for pressure losses due to pipeline leakage. Algonquin is proposing to primarily use surface water sources for hydrostatically testing the pipeline facilities. If a sufficient amount of water cannot be withdrawn from one of the potential surface water sources identified, Algonquin proposes to use a clean municipal water source(s) obtained from municipal supplies, local vendors, or other approved sources/locations. Algonquin also proposes to use clean municipal water to hydrostatically test the proposed Rehoboth Compressor Station. Because groundwater supply wells contribute to the public water supply (i.e., municipal water) in some municipalities along and adjacent to the proposed Project facilities, groundwater could be indirectly used during hydrostatic testing of the pipeline facilities. The estimated hydrostatic test water requirements and potential sources are listed in table 4.3.2-5.

TABLE 4.3.2-5

Potential Hydrostatic Test Water Source Locations

State/Facility	Volume (gallons)	Source
Massachusetts		
I-10 Extension	3,215,000	Weymouth Fore River, Great Pond, Sylvan Lake, Glen Echo Pond, and municipal sources
Q-1 System Replacement	1,915,000	Glen Echo Pond and municipal sources
Rehoboth Compressor Station	To be determined	Municipal source
Connecticut		
E-3 System Replacement	345,000	Fairview Reservoir, Shetucket River, Avery Pond, and Lake of Isles (Lake Nova)

In Massachusetts, Algonquin has identified several potential sources of hydrostatic test water for the I-10 Extension and Q-1 System Replacement. These include the Weymouth Fore River, Great Pond, Sylvan Lake, and Glen Echo Pond, as well as municipal sources. Approximately 5.13 million gallons of water would be required for hydrostatic testing of the I-10 Extension and the Q-1 System Replacement. Algonquin proposes to use a clean municipal water source(s) for hydrostatic testing at the Rehoboth

Compressor Station; however, the volume of water to be used during this activity has not been determined.

In Connecticut, Algonquin has identified the Fairview Reservoir, the Shetucket River, Avery Pond, and the Lake of Isles (Lake Nova) as potential hydrostatic test water sources. Approximately 345,000 gallons of water would be required for hydrostatic testing of the E-3 System Replacement.

The withdrawal of large volumes of water from surface water sources could temporarily affect the recreational and biological uses of the resource if the diversions constitute a large percentage of the source's total flow or volume. Hydrostatic test water withdrawals could also result in the temporary loss of habitat, changes in water temperature and dissolved oxygen levels, and entrainment or impingement of fish or other aquatic organisms. The withdrawal of large volumes of water from private or public water supply wells could exceed the delivery capacity of the system or well.

Algonquin would minimize the potential for these effects by adhering to the hydrostatic testing measures included in its E&SCP (see Appendix F). These measures include screening intake hoses and regulating the withdrawal of hydrostatic test water at a rate that would maintain ambient downstream flow rates to protect aquatic life, provide for all waterbody uses, and to provide for downstream withdrawals of water by existing users. The rate of water withdrawal from private or municipal sources would be limited so as not to exceed the delivery capacity of the system or well. Other measures include locating test manifolds outside of wetlands and riparian areas (where practicable); not withdrawing from or discharging into state-designated special waters, waters that provide habitat for federally listed or threatened species, or into waterbodies designated as public water supplies. The pumps used for hydrostatic testing would be operated and fueled in accordance with Algonquin's SPCC Plan. Although Algonquin has listed Great Pond as a potential source of hydrostatic test water, Great Pond is mapped by the MassNHESP as Priority Habitat for special status species. Therefore, in accordance with its E&SCP, Algonquin could not use Great Pond as a hydrostatic test water source unless it obtains written approval from the MassNHESP.

Algonquin does not anticipate the use of chemicals during testing or the drying of the pipeline following completion of the testing. Potential impacts resulting from the discharge of hydrostatic test water can include soil erosion and stream scour and subsequent degradation of water quality. Algonquin would minimize the potential for these impacts by discharging the test water in accordance with the requirements of the applicable Massachusetts and Connecticut NPDES permits. Discharges would be controlled to prevent scour and sedimentation, flooding, and the introduction of foreign or toxic substances into the waterbodies. The discharge rate would be regulated, and water would be discharged through an energy dissipation device and sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, flooding, or excessive streamflow. The energy dissipation device would consist of a large diameter pipe diffuser located at the terminus of the discharge pipe. The water would be either discharged into a waterbody or into a dewatering structure located in a well-vegetated and stabilized upland area within or adjacent to the construction work area. These discharge sites would be selected to maintain at least a 50-foot vegetated buffer from adjacent waterbody/wetland areas; however, if an adequate buffer is not available, Algonquin would install sediment barriers or similar erosion control measures to minimize potential impacts. Samples of the hydrostatic test water would be collected and tested in accordance with federal and state permit requirements.

Dust Control Water

Water would also be needed to control fugitive dust during construction. Algonquin has not prepared a Dust Control Plan or specified the sources of water that would be used for dust control. The impacts on water resources due to water withdrawals for dust control would be the same as those discussed above for hydrostatic test water withdrawals. Because Algonquin did not provide estimates of

the quantities of water that would be required for dust control or specify the water sources or measures to protect aquatic resources during dust control water withdrawals if a surface water source would be used, **we recommend that:**

- **Algonquin should prepare a Dust Control Plan that specifies the following:**

  a. the sources of water that would be used for dust control;

  b. the anticipated quantities of water that would be required; and

  c. measures to minimize fish and fish egg entrainment during dust control water withdrawals if a surface water source would be used.

  The Dust Control Plan should be filed with the Secretary <u>during the draft EIS comment period</u>.

Water for the HDD Operations

As discussed in section 4.3.2.4, Algonquin would cross the Weymouth Fore and Shetucket Rivers using the HDD method, which involves drilling a pilot hole under the waterbody and banks, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe. Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring non-toxic materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry is referred to as drilling mud. In section 4.3.2.4, we are recommending that Algonquin revise its HDD Contingency Plan to identify the sources of water that would be used for mixing the drilling mud and file it with the Secretary, for review and written approval by the Director of OEP.

4.3.3 NSTAR Alternative

4.3.3.1 Groundwater Resources

The impacts of construction and operation of the NSTAR Alternative on groundwater would be similar to those described for the proposed pipeline route. The alternative would not cross any state-designated aquifers and would not affect any public water supply wells or other groundwater supplies. The construction work area for the NSTAR Alternative would be located within 150 feet of six private water supply wells. No wellhead or aquifer protection areas would be crossed or affected by the alternative. Three sites that potentially contain contaminated groundwater are located within 1,000 feet of the NSTAR Alternative. Of these sites, two are also within 1,000 feet of the corresponding segment of the proposed route.

4.3.3.2 Surface Water Resources

The NSTAR Alternative would cross four minor waterbodies, including two perennial and two intermittent streams. The corresponding segment of the proposed route would cross two perennial streams and one intermittent stream. All of the waterbodies along the NSTAR Alternative would be crossed using the wet open-cut method. No navigable waters, DPAs, sensitive surface waters (including impaired waters, ORWs, federal wild and scenic rivers, waterbodies containing threatened and endangered species, and fisheries of special concern) would be crossed by the NSTAR Alternative. The alternative would cross approximately 3,581 linear feet of public surface water protection zones (Zones A, B, and C). However, none of the waterbodies crossed by the alternative are upstream of the sources of these public surface water resources. No waterbodies located along the NSTAR Alternative are known to have contaminated sediments.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation adapted for life in saturated soil conditions (COE, 1987). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality.

Wetlands in the Project area are regulated at the federal and state levels. On the federal level, the COE has authority under section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands. Section 401 of the CWA requires that proposed dredge and fill activities under section 404 be reviewed and certified by the designated state agency so that the proposed Project would meet state water quality standards. The designated state agencies in Massachusetts and Connecticut are the MassDEP and the CTDEP, respectively. In Massachusetts and Connecticut, wetlands are also regulated at the local level through municipal Conservation Commissions and Inland Wetland and Watercourses Commissions, respectively.

4.4.1 Existing Wetland Resources

Pipeline Facilities

Wetlands were delineated mostly during the summer of 2007 using the methodology described in the 1987 COE Wetland Delineation Manual, Technical Report Y-87-1 (COE, 1987) and the new wetland jurisdictional determination process (Rapanos Guidance memorandum). The Rapanos Guidance memorandum provides direction to ensure that jurisdictional determinations under the CWA are consistent with the Supreme Court decision in the Rapanos and Carabell litigation. A wetland delineation report was completed based on field data collected prior to May 2008, and was submitted to the COE with Algonquin's application for a section 404/10 Individual Permit on June 16, 2008. Wetlands that could not be surveyed in the field due to lack of survey permission were identified using MassGIS data (MassGIS, 2007).

After filing the COE application, Algonquin completed additional wetland delineations on previously inaccessible parcels. These new surveys included areas along the I-10 Extension between MPs 10.5 and 12.0, two pipe storage yards, the Rehoboth Compressor Station site, and portions of the I-10 Extension and Q-1 System Replacement that were being evaluated for minor route variations and temporary extra workspace modifications. Algonquin submitted updated alignment sheets and tabulated wetland impacts in a supplemental filing to the FERC in August 2008.

Algonquin's field surveys and MassGIS analysis identified 63 wetlands along the I-10 Extension, 31 wetlands along the Q-1 System Replacement, and 43 wetlands along the E-3 System Replacement. The location, wetland identifier, FWS National Wetlands Inventory (NWI) classification, crossing length, and approximate acreage of each wetland that would be affected by construction and operation of the Project are listed in table H-1 in Appendix H. A summary of the wetland impacts associated with construction and operation of the Project is presented in section 4.4.2.

Aboveground Facilities

Algonquin identified several wetlands on the Rehoboth Compressor Station property. However, no wetlands were identified in the areas that would be disturbed by construction or operation of the compressor station facilities. No wetlands were identified at any of the other aboveground facility sites.

Pipe Storage and Contractor Ware Yards

No wetlands were identified in the areas that would be disturbed for the pipe storage and contractor ware yards.

Access Roads

Wetlands would be crossed by three temporary access roads and one new permanent access road in Massachusetts. The permanent road (PAR 12.24) and two of the three temporary roads (TAR 13.88 and TAR 15.57) are along the Q-1 System Replacement. Access road TAR 3.14 is along the I-10 Extension.

4.4.1.1 Wetland Types

Wetland types were assigned based on the NWI classifications as described in Cowardin et al. (1979). This classification is a hierarchical system based primarily on the general classification into marine, estuarine, palustrine (freshwater wetland), riverine (stream), or lacustrine (lake) systems, and the dominant vegetation layer. Wetlands that are classified as marine, riverine, and lacustrine are listed under waterbodies in section 4.3.2. The basic wetland types that were delineated in the proposed Project area are discussed below.

Palustrine Forested Wetlands (PFO)

The majority of the forested wetlands identified along the proposed E2W Project are classified as palustrine forested broad-leaved deciduous, including red maple swamps and hardwood floodplain communities. These wetlands typically occur in areas where the topography is low and flat or along waterbodies.

Forested wetland 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 20 feet tall (Cowardin et al., 1979). Forested wetlands typically have a mature tree canopy that, depending upon the species and density, can have a broad range of understory and groundcover community components.

Within the proposed Project area, red maple swamps occur in poorly drained basins in association with lakes and peatlands. These swamps are characterized by seasonally flooded, inorganic soils. During field surveys, white pine, yellow birch, eastern hemlock, and American elm were often found in association with red maple swamps. Black gum, black ash, and swamp white oak were also found associated with red maple swamps. Typical shrub species in the understory included highbush blueberry, sweet pepperbush, spice bush, northern arrowwood, poison sumac, winterberry, and silky dogwood. Depending upon the degree of shading, soil characteristics, and the degree of flooding, groundcover species found within red maple swamps included cinnamon, royal, marsh, and sensitive ferns; skunk cabbage; sphagnum moss; and jewelweed.

Field surveys identified one location along the I-10 Extension that contains a community of Atlantic white cedar, which tends to grow in acidic swamps and bogs often covered below with a mat of sphagnum moss. Additional discussion of special or significant wetland vegetation is included in section 4.5.3.

Palustrine Scrub-Shrub Wetlands (PSS)

Palustrine scrub-shrub wetlands include areas that are dominated by saplings and shrubs that typically form a low and compact structure less than 20 feet tall (Cowardin et al., 1979). The structure

and composition of vegetation within this cover type may be influenced by water regime and, where located within existing rights-of-way, by utility maintenance practices. Most scrub-shrub communities are seasonally flooded and often saturated to the surface. Many of the scrub-shrub wetlands along the proposed pipeline routes are associated with emergent wetlands as part of larger wetland complexes. These scrub-shrub wetlands are also the dominant wetland type along existing NSTAR powerline rights-of-way.

Common vegetation in scrub-shrub wetlands within the proposed Project area includes speckled alder, northern arrowwood, silky dogwood, winterberry, and highbush blueberry. Spice bush, sweet pepperbush, meadowsweet, and swamp azalea are common associates. Within the NSTAR powerline right-of-way, the invasive shrub glossy buckthorn is frequently dominant, while buttonbush is commonly found in flooded wetlands and vernal pools along the proposed pipeline routes.

Palustrine Emergent Wetlands (PEM)

Palustrine emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al., 1979). The freshwater emergent wetlands along the pipeline routes include areas commonly referred to as marshes, wet meadows, and beaver flowage communities. The palustrine emergent wetland type exists on its own as well as in conjunction with other wetland types, which creates a more heterogeneous wetland system.

Freshwater emergent wetlands along the proposed pipeline routes are often associated with the NSTAR powerline rights-of-way, abandoned agricultural areas, and open waterbodies. Vegetation found in emergent wetlands consists of a variety of submergent, emergent, and other rooted herbaceous species. Cattail communities are usually located in protected basins along slow-moving streams and ponds.

Freshwater, sedge meadow communities are frequently associated with organic or mucky soils that are seasonally flooded or permanently saturated. Tussock sedge can dominate these sedge meadow communities. Woolgrass, green bulrush, great bulrush, and soft rush are common associates. During field surveys, species such as Joe-pye weed, tearthumb, Halberd-leaved tearthumb, and burreeds were often found in these emergent wetland communities as well. These wetlands often occur along slow streams and around the borders of ponds and other open water areas.

Freshwater, wet meadow communities are dominated by grasses and sedges on permanently saturated mineral soils with little accumulation of peat. Representative species found in these emergent wetlands include reed canarygrass, woolgrass, and various sedges. These meadows are often found near flowing water where scouring prevents the accumulation of peat and organic material. Other common locations are where groundwater hydrology or surface water runoff have been altered, creating wetlands on mineral soils.

Beaver flowage communities are typically temporary marshes and ponded areas created by beaver activity in freshwater systems. Vegetation can vary depending on the topography of the basin and soils, but typically consists of floating leaved aquatics and emergents such as bulrushes, woolgrass, cattail, and purple loosestrife.

Some palustrine emergent wetlands along the proposed pipeline routes are dominated primarily by invasive species, such as purple loosestrife, common reed, and multiflora rose. These communities are particularly common in urbanized or previously disturbed areas.

Estuarine Emergent Wetlands (EEM)

Estuarine systems within the proposed Project area are present in the intertidal zone, which defines the area that is not permanently submerged under the ocean but is at least occasionally inundated

with saltwater. The salinity in estuarine wetland systems may also be diluted by freshwater runoff from land (Cowardin et al., 1979). Estuarine emergent wetlands, also referred to as salt marshes, are characterized by the influence of tides and the presence of salt-tolerant herbaceous species.

The proposed Project would cross one estuarine emergent wetland at the mouth of the Weymouth Fore River at the beginning of the I-10 Extension. Typical salt marsh species associated with this wetland type include salt marsh cordgrass, saltgrass, salt marsh rush, and salt meadow cordgrass.

Forested/Scrub-Shrub/Emergent Wetlands

Some wetlands along the proposed pipeline routes are best characterized as having co-dominance between vegetation types, such as a mixed forested and scrub-shrub community. On NWI maps, these can appear as PFO/PSS, PFO/PEM, and PSS/PEM and may occur as adjacent communities within a single wetland, or a single co-dominant community. Communities with mixed dominance are composed of vegetation similar to that described above for palustrine forested, palustrine scrub-shrub, and palustrine emergent wetlands.

Outstanding Resource Waters

As discussed in sections 4.3.2.1 and 4.3.2.7, in Massachusetts the ORW designation applies to both the waterbody and any bordering wetlands and associated tributaries (314 CMR section 4.06 (3) and (2)(a)). Excluding certified vernal pools and their associated wetlands, the Project would cross 10 ORW wetlands, all of which are found along the I-10 Extension. These wetlands are identified in table 4.4.1-1.

TABLE 4.4.1-1

Outstanding Resource Water Wetlands along the HubLine/East to West Project

State/Facility/Wetland ID	Milepost	Reason for ORW Status
Massachusetts		
I-10 Extension		
I-10-W20 (associated with Cranberry Brook)	5.6	Tributary/wetland to Public Water Supply: Unnamed Reservoir – Richardi Reservoir, and Cranberry Brook Watershed Area of Critical Environmental Concern.
I-10-W19 (associated with unnamed tributary to Cranberry Pond)	5.9	Wetland adjacent to Unnamed Tributary to Cranberry Pond.
I-10 W27	6.7	Wetland adjacent to Tumbling Brook.
I-10 W27A	6.8	Wetland adjacent to unnamed tributary to Tumbling Brook.
I-10 W28	7.0	Wetland adjacent to Tumbling Brook (abuts stream outside of the Project area).
I-10 W31	7.2	Wetland adjacent to two unnamed tributaries to Tumbling Brook.
I-10 W32	7.7	Wetland adjacent to Sylvan Lake, designated Outstanding Resource Water.
I-10 W33	7.9	Wetland adjacent to the Cochato River.
I-10 W35	8.3	Wetland adjacent to Mary Lee Brook.
I-10 W38	9.6	Wetland adjacent to Three Swamp Brook.
Q-1 System Replacement		- None -
Connecticut		
E-3 System Replacement		- None -

4.4.2 General Impacts and Mitigation

Table 4.4.2-1 summarizes the potential impacts of the Project facilities on wetlands. A detailed listing of the impacts on each wetland that would be crossed is included in table H-1 in Appendix H. Construction of the proposed pipelines would result in a total of 59.8 acres of temporary wetland impacts. This includes 34.1 acres of non-forested wetlands (emergent, scrub-shrub, and open water wetlands) and 25.7 acres of forested wetlands. Vegetation maintenance during operation of the pipeline would convert approximately 4.4 acres of forested wetlands to non-forested wetland types and 4.8 acres of scrub-shrub wetlands to emergent wetland types. No wetlands would be permanently impacted by the construction or operation of the proposed aboveground facilities. Wetlands would be crossed by three temporary access roads and 0.1 acre of wetland would be filled by a new permanent access road.

The primary impact of pipeline construction and right-of-way maintenance activities on wetlands would be the temporary alteration of wetland vegetation. Other types of impacts associated with construction of the pipeline facilities could include temporary changes in wetland hydrology and water quality. Trenching and backfilling activities would also temporarily impact wetlands because the backfill material is considered to be fill, even if the original material excavated is put back in the same location. During construction, failure to segregate topsoil over the trenchline in non-saturated wetlands could result in the mixing of the topsoil with the subsoil. This disturbance could result in altered biological activities and chemical conditions in wetland soils and could affect the re-establishment and natural recruitment of native wetland vegetation after restoration. In addition, inadvertent compaction and rutting of soils during construction could result from the movement of heavy machinery and the transport of pipe sections. The resulting alteration of the natural hydrologic patterns could inhibit seed germination or increase the potential for siltation in wetlands. The discharge of stormwater, trench water, or hydrostatic test water could result in silt-laden water entering a wetland and cause the release of chemical and nutrient pollutants from sediments. Construction clearing activities and disturbance of wetland vegetation could also temporarily affect the wetland's capacity to buffer flood flows and/or control erosion.

These effects would be greatest during and immediately following construction. The majority of these effects would be short term in nature and would cease when or shortly after the wetlands are restored and seeded. Following construction, new wetland vegetation would become established, which would eventually transition back into a community with functionality similar to that of the wetland before construction. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 1 to 3 years).

Following revegetation, there would be no permanent impact on emergent wetland vegetation in the maintained right-of-way because these areas naturally consist of and would remain as open and herbaceous communities. Although Algonquin's E&SCP allows annual maintenance of a 10-foot-wide strip centered over the pipeline to facilitate corrosion/leak surveys, it does not generally mow or otherwise maintain herbaceous wetland vegetation in the pipeline right-of-way.

TABLE 4.4.2-1

Summary of Wetlands Affected by Construction [a] and Operation [b] of the HubLine/East to West Project

Facility/State	Total Wetland Area Affected (acres)	Wetland Type: Non-Forested Wetland [c] Const.	Non-Forested Wetland [c] Oper.	Forested Wetland Const.	Forested Wetland Oper.
Pipeline Facilities					
Massachusetts					
I-10 Extension	17.6	9.6	2.9	8.0	2.9
Q-1 System Replacement	21.1	16.2	1.9	4.9	1.2
Connecticut					
E-3 System Replacement	21.1	8.3	0.0	12.8	0.3
Pipeline Facilities Total	*59.8*	*34.1*	*4.8*	*25.7*	*4.4*
Aboveground Facilities					
Massachusetts					
Rehoboth Compressor Station	0.0	0.0	0.0	0.0	0.0
Fore River OPP Regulator Station and Pig Launcher	0.0	0.0	0.0	0.0	0.0
Sharon OPP Regulator Station	0.0	0.0	0.0	0.0	0.0
Beginning-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	0.0	0.0	0.0	0.0	0.0
End-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	0.0	0.0	0.0	0.0	0.0
Beginning of E-3 System Pig Launcher	0.0	0.0	0.0	0.0	0.0
End-of-E-3 System Pig Launcher/Receiver	0.0	0.0	0.0	0.0	0.0
Mainline Valves, Taps, and Remote Blow-off Valves	0.0	0.0	0.0	0.0	0.0
Aboveground Facilities Total	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Pipe Storage and Contractor Ware Yards					
Massachusetts	0.0	0.0	0.0	0.0	0.0
Connecticut	0.0	0.0	0.0	0.0	0.0
Pipe Storage and Contractor Ware Yards Total	0.0	0.0	0.0	0.0	0.0
Access Roads					
Massachusetts	0.3	0.0	0.0	0.3	0.1
Connecticut	0.0	0.0	0.0	0.0	0.0
Access Road Total	0.3	0.0	0.0	0.3	0.1
Project Total	60.1	34.1	4.8	26.0	4.5

[a] Construction impacts are based on a proposed nominal 85-foot-wide construction right-of-way for the I-10 Extension and Q-1 System Replacement and a nominal 75-foot-wide construction right-of-way for the E-3 System Replacement and areas where the right-of-way is wider than the nominal 75- to 85-foot-wide configuration as well as staging areas and extra workspaces at feature crossings.

[b] Based on a 30-foot-wide permanent easement in forested wetlands and a 10-foot-wide permanent easement in non-forested wetlands.

[c] Non-forested wetlands include palustrine emergent, palustrine scrub-shrub, and palustrine open water wetlands.

The duration of the impact on scrub-shrub and forested wetlands would be longer. Woody vegetation may take several years to regenerate and the re-establishment of large woody vegetation would be precluded on a portion of the permanent right-of-way by routine vegetation maintenance activities during operation of the pipeline. Vegetation maintenance in wetlands would include the potential annual mowing and maintenance of a 10-foot-wide herbaceous strip centered over the pipeline and the cutting of woody vegetation that is greater than 15 feet in height within 15 feet of the pipeline centerline. This would convert previously forested wetland areas to non-forested wetland areas and scrub-shrub wetland

areas to emergent wetland areas. The conversion from one vegetation cover type to another could result in changes in wetland functions and values by altering the amount of sunlight or other environmental conditions in the wetland. In general, however, it is expected that the affected wetlands would continue to provide important ecological functions such as sediment/toxicant retention, nutrient removal/ transformation, flood attenuation, groundwater recharge/discharge, and wildlife habitat.

Algonquin avoided wetland impacts in Massachusetts and Connecticut where practicable by routing the pipelines to avoid the crossing of wetlands and minimized wetland impacts by using existing cleared rights-of-way to construct the pipeline. Algonquin would mitigate unavoidable construction- and operation related impacts by implementing its E&SCP, and by complying with the conditions of its COE section 404 permit conditions and MassDEP and CTDEP section 401 permits. Specific measures that would be implemented in accordance with Algonquin's E&SCP include:

- locating extra work areas at least 50 feet away from wetland boundaries except where site-specific conditions warrant otherwise and agency approval has been obtained;
- cutting vegetation just above ground level, leaving existing root systems in place, and limiting the pulling of stumps and grading activities to directly over the trenchline except where the Chief Inspector and EI determine that these activities are required outside the trenchline area for safety reasons;
- installing sediment barriers immediately after initial ground disturbance within the right-of-way at the edge of the boundary between wetlands and uplands, across the entire right-of-way immediately upslope of the wetland boundary, and along the edge of the right-of-way as necessary to contain spoil within the right-of-way and to protect adjacent off-right-of-way wetland areas;
- segregating the top 12 inches of topsoil from the trenchline, except in areas where standing water is present or soils are saturated or frozen;
- prohibiting the use of rock, soil imported from outside the wetland, tree stumps, or brush riprap to stabilize the right-of-way;
- using low ground weight equipment or operating equipment on timber riprap, prefabricated equipment mats, or terra mats on saturated soils or where standing water is present;
- using the push-pull or float technique to place the pipeline in the trench where water and other site conditions allow;
- installing trench plugs and/or sealing the trench bottom as necessary to maintain the original wetland hydrology;
- prohibiting the use of lime or fertilizer during the restoration of wetlands;
- seeding wetlands with annual ryegrass or a wetland seed mix unless standing water is present;
- limiting vegetation maintenance in wetlands to a 10-foot-wide herbaceous corridor centered over the pipeline and the cutting and removal of trees and shrubs greater than 15 feet in height that are within 15 feet of the pipeline centerline; and

- prohibiting the use of herbicides or pesticides within 100 feet of wetlands or waterbodies except as specified by the appropriate land management or state agency.

In accordance with its E&SCP, Algonquin would conduct post-construction monitoring of the right-of-way in affected wetlands. These efforts would include monitoring the success of wetland revegetation annually for 3 years after construction, or longer until wetland revegetation is successful. The monitoring efforts would also include documenting occurrences of exotic invasive species to compare to preconstruction conditions. As discussed in section 4.5, Algonquin conducted field surveys and recorded the presence of invasive species during its wetland delineations and developed an Invasive Plant Species Control Plan (see Appendix L) that describes construction-phase mitigation, post-construction monitoring, and remediation that would be implemented to control the spread of invasive wetland plant species.

Massachusetts

Approximately 39.0 acres of wetlands would be affected by the E2W Project in Massachusetts. Approximately two-thirds of these wetlands (25.8 acres) are non-forested wetlands. The remainder (about 13.2 acres) is forested wetland. Approximately 0.1 acre of forested wetlands would be filled during the construction of a new permanent access road. An additional 4.8 acres of non-forested wetland and 4.4 acres of forested wetland would be permanently affected by ongoing vegetation maintenance during operation of the pipelines.

Wetlands would be crossed by three temporary access roads and one new permanent road. Access road TAR 3.14 is along the I-10 Extension and would require about a 45-foot-long wetland crossing. This access road would be temporarily improved by methods described in Algonquin's E&SCP to provide safe and stable passage to the work area. The unpaved area would require minor clearing, grading, and matting in some locations. Other improvements may include the use of timber mats and/or rock access pads placed on geotextile fabric across the 45-foot-wide wetland area. These modifications and improvements would not impact forested wetland. After construction when the road is no longer needed, any construction materials that were used would be removed from the wetland and the site would be restored to its preconstruction condition as described in Algonquin's E&SCP and in its Wetland Restoration Procedures for Temporary Wetland Impacts (see Appendix M).

The permanent road (PAR 12.24) and two of the three temporary roads (TAR 13.88 and TAR 15.57) are along the Q-1 System Replacement. Access road PAR 12.24 would require the filling of about 0.1 acre of forested wetland. Algonquin has included the impact on this wetland in its wetland compensation plan, which is discussed in section 4.4.4. Access roads TAR 13.88 and 15.57 are existing gravel or dirt/fill roads. Algonquin would not change the current footprints of these roads and does not anticipate needing to conduct any additional clearing to use the roads. However, some maintenance of the existing road surfaces, such as minor grading, and some minor tree trimming may be required. Algonquin indicates these activities would not impact the wetlands that the roads would cross. Algonquin has stated that it would consult with the MassDEP and the Sharon Conservation Commission to address any potential secondary wetland impacts that could result from the use of access roads TAR 13.38 and TAR 15.57.

Wetland Resource Areas Defined in the Massachusetts Wetlands Protection Act

Several wetland resource areas are regulated under 310 CMR 10 of or defined in the Massachusetts Wetland Protection Act (MWPA). Freshwater resource area types along the pipeline routes include: Bordering Vegetated Wetlands (BVW); Isolated Vegetated Wetlands (IVW); Bordering Land Subject to Flooding (BLSF); Isolated Land Subject to Flooding (ILSF); Riverfront Area (RFA);

Land Under Waterbodies and Waterways (LUW); and Bank. Estuarine or marine resource areas identified during Algonquin's field surveys include: Coastal Bank; Land Under the Ocean (LUO); Land Containing Shellfish (LCS); Salt Marsh; DPAs; and Land Under Rivers that Underlie Anadromous/ Catadromous Fish Runs (Fish Runs).

The boundaries of these resources are not necessarily mutually exclusive from each other or from the wetland habitats described in section 4.4.1, and in many cases the boundaries of these resource areas overlap. These state wetland resource areas are discussed below.

Bordering Vegetated Wetland – BVWs are freshwater wetlands that border on creeks, rivers, streams, ponds, and lakes. BVWs encompass several different vegetation cover types including forested swamps, scrub-scrub wetlands, wet meadows, and marshes. In total, the Project crosses 98 individual wetland areas in Massachusetts. Impacts and procedures to minimize the effect of the Project on BVWs are described in the general impacts and mitigation discussion in section 4.4.2.

Isolated Vegetated Wetlands – IVWs are freshwater wetlands that do not border a creek, river, stream, pond, or lake. IVWs, unless defined as ILSF or certified vernal pools, do not fall under the jurisdiction of the MWPA; however, they are protected under the COE regulations and certain municipal wetland protection bylaws. Municipalities that have wetland protection by-laws that identify IVWs include Sharon, Canton, Stoughton, Avon, Holbrook, Braintree, and Weymouth. Like BVWs, IVWs consist of several different vegetation cover types including forested swamps, scrub-scrub wetlands, wet meadows, and marshes. Ten IVW resource areas have been identified along the E2W Project route in Massachusetts. All of these IVWs are located within municipalities that have wetland protection bylaws that protect IVWs. In many cases, Algonquin was unable to delineate the entire limit of these wetland areas due to the narrow width of its survey corridor. Unless the entire confines of a wetland area could be identified, Algonquin generally classified the area as a BVW. Impacts on IVWs and the procedures and mitigation measures that would be used in IVWs are similar to those for BVWs and are described in section 4.4.2.

Bordering Land Subject to Flooding – BLSFs are areas with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds, or lakes. The boundaries of BLSFs are defined by the 100-year floodplain, as identified by the National Flood Insurance Program, Federal Emergency Management Agency maps. These boundaries are generally confined between upland habitats along steep riverbanks or within stream floodways. Typical wetland habitat types contained within this resource area include forested wetlands, scrub-shrub wetlands, emergent wetlands, or combinations of these types. The E2W Project would cross 13 BLSF areas in Massachusetts. Impacts on areas that may qualify as BLSF would be similar to impacts on BVWs and IVWs and similar procedures and mitigation measures would be used to protect areas classified as BLSF.

Isolated Land Subject to Flooding – In general, ILSF is an isolated depression or basin that floods due to ponding of runoff or high groundwater and at least once a year confines standing water to a volume of at least 0.25 acre-feet and to an average depth of at least 6 inches. Typical wetland habitat types contained within this resource area include forested wetlands, scrub-shrub wetlands, emergent wetlands, or combinations of these types. Impacts on areas that may qualify as ILSF would be similar to impacts on BVWs and IVWs and similar procedures and mitigation measures would be used to protect areas classified as ILSF.

Riverfront Area – RFA is the area of land between a river or perennial stream's mean annual high water line and a parallel line measured horizontally (200 feet). RFA may include or overlap other resource areas or their buffer zones. Of the 23 waterbodies crossed by the E2W Project in Massachusetts, 13 (8 along the proposed I-10 Extension and 5 along the proposed Q-1 System Replacement) are

perennial streams where the 200-foot RFA applies. Impacts on RFAs are addressed in our assessment of surface waters and would be minimized by the procedures used to protect waterbodies (see section 4.3.2.2).

Land Under Waterbodies and Waterways/Bank – LUWs are land beneath any creek, river, stream, pond, or lake and may be composed of organic muck or peat, fine sediments, rocks, or bedrock. The resource area described as Bank is directly related to LUW. A Bank is the portion of the land surface that normally abuts and confines a waterbody and is located between a waterbody and a wetland, floodplain, or upland area. A Bank may be partially or totally vegetated or consist of exposed soil, gravel, or stone. Perennial waterbodies are associated with Banks on each side of the waterbody. The bank of an intermittent waterbody is measured as a single line within the waterbody. A total of 23 waterbodies (13 perennial and 10 intermittent) and 13 areas defined as LUW (associated with the perennial waterbodies) would be crossed by the E2W Project in Massachusetts. Impacts on LUWs and Banks are addressed in our assessment of surface waters and would be minimized by the procedures used to protect waterbodies (see section 4.3.2.2).

Coastal Bank – Coastal Bank is defined under the MWPA regulations (310 CMR 10.30) as "the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland." A particular Coastal Bank may serve both as a sediment source and as a vertical buffer to storm waters, or it may serve only one role. Two Coastal Banks are located near the beginning of the proposed I-10 Extension route at the Weymouth Fore River (MPs 0.0 to 0.7). Impacts on the Coastal Bank would be avoided through the use of the HDD construction method at this location.

Land Under the Ocean – LUO is defined in the MWPA regulations (310 CMR 10.25) as "land extending from the mean low water line seaward to the boundary of the municipality's jurisdiction, including land under estuaries. The nearshore LUO (land under ocean) designation includes areas closest to the shore that do not exceed a depth of 80 feet at MLW." The E2W Project crosses LUO associated with the Weymouth Fore River in Weymouth and Braintree. Impacts on LUO would be avoided through the use of the HDD construction method at this location.

Land Containing Shellfish – LCS is defined under the MWPA regulations (310 CMR 10.34) as "land under the ocean, tidal flats, rocky intertidal shores, salt marshes and land under salt ponds when any such land contains shellfish." The Weymouth Fore River crossing (MPs 0.0 to 0.9) has been identified as LCS. Impacts on LCS would be avoided through the use of the HDD construction method at this location.

Salt Marsh – Salt marsh is defined as a coastal wetland extending landward to the highest high tide line and is characterized by vegetation adapted to living in saline soils, including salt meadow cord grass (*Spartina patens*) and/or salt marsh cord grass (*Spartina alterniflora*). A salt marsh may contain tidal creeks, ditches, and pools. The Weymouth Fore River crossing on the I-10 Extension contains approximately 300 feet of salt marsh at approximate MP 0.8. Impacts on salt marsh would be avoided through the use of the HDD construction method at this location.

Deepwater Port Areas – There are currently 11 DPAs in Massachusetts, which were established to promote marine industrial development in port areas with key industrial attributes, such as deepwater channels, established rail and transportation links, and public utility services conducive to industry. The Weymouth Fore River crossing between MPs 0.0 and 0.9 on the I-10 Extension has been identified as a DPA. Impacts on DPA would be avoided through the use of the HDD construction method at this location.

Algonquin submitted an application for a section 401 Water Quality Certification to the MassDEP on July 2, 2008. Algonquin would address each of the wetland resource areas described above through the section 401 permit review process. Algonquin would also address the wetland resource areas in its applications to the local Conservation Commissions. Algonquin has stated that it would also provide copies of the information contained in these applications, including details regarding the specific functions and values of the wetland resource areas that may be affected, in a draft EIR addendum that would be submitted to the Secretary of the MEEA shortly after the draft EIS is issued (see section 1.3).

Land Under Rivers that Underlie Anadromous/Catadromous Fish Runs – Fish Run area is defined under the MWPA Regulations (310 CMR 10.35) as "that area within estuaries, ponds, streams, creeks, rivers, lakes or coastal waters, which is a spawning or feeding ground or passageway for anadromous or catadromous fish and which is identified by Massachusetts Division of Marine Fisheries (MassDMF), or have been mapped on the Coastal Atlas of the Coastal Zone Management Program." These fish runs include all areas that have historically served as fish runs and are either being restored or planned to be restored. The Weymouth Fore River that would be crossed by the I-10 Extension contains anadromous/catadromous fisheries. Impacts on anadromous/catadromous fish runs would be avoided through the proposed use of the HDD construction method at this location.

Connecticut

Approximately 21.1 acres of wetlands would be affected by the E2W Project in Connecticut. Approximately two-thirds of these wetlands (12.8 acres) are forested wetlands. None of these wetlands would be filled. Moreover, because most of the E-3 System Replacement would occur on Algonquin's existing easement, only about 0.3 acre of forested wetland would be permanently affected. The remaining wetland areas (about 8.3 acres) that would be affected are non-forested and would not be permanently affected by ongoing vegetation maintenance during operation of the pipeline.

As discussed in section 4.5.3, the CTDEP identified a mapped significant natural wetland community that would be crossed by the E-3 System Replacement between MPs 6.6 and 7.3. This wetland area is designated as an acidic Atlantic white cedar basin swamp. On October 10, 2007, Algonquin and the CTDEP Wildlife Division conducted a field review of the designated Atlantic white cedar swamp community area to assess the existing community and to survey for state-protected plant species. The proposed pipeline would be located within Algonquin's existing right-of-way in this area and no Atlantic white cedar trees were observed within or adjacent to the existing pipeline right-of-way. In addition, no federally or other state-protected plant species were observed (Murray, 2007). As discussed in section 4.5.4, the CTDEP noted that common reed is growing in the area and recommended that Algonquin conduct pre- and post-construction applications of herbicides. Algonquin has not yet agreed to this recommendation but has indicated that it would continue to consult with the CTDEP to develop appropriate measures to control common reed at this location.

4.4.3 Extra Workspace In or Within 50 Feet of Wetlands

The FERC Procedures stipulate that the construction right-of-way width in wetlands should be limited to 75 feet and that all temporary extra workspaces should be located at least 50 feet from wetlands except where an alternative measure has been requested by the applicant and approved by the FERC.

Algonquin has proposed to use an 85-foot-wide construction right-of-way in all of the wetlands crossed by the I-10 Extension and Q-1 System Replacement pipelines in Massachusetts. Algonquin states that a 75-foot-wide right-of-way is insufficient for wetland construction and the wider right-of-way is necessary to maintain minimum DOT and OSHA worker safety requirements and accommodate the large amount of unconsolidated soil that would be excavated within wetlands. We agree that the proposed 36-

inch-diameter I-10 Extension pipeline is much larger than most of Algonquin's existing pipelines. Installation of this size pipe would require the use of larger equipment than is necessary for smaller diameter pipe. It would also require a deeper and wider trench and would generate a larger volume of spoil, that would need to be stored on the right-of-way. Accommodating all of these elements for a 36-inch-diameter pipeline within a 75-foot-wide right-of-way can be difficult even under dry and flat conditions. Under wetter soil conditions it may be necessary to excavate a wider trench and more material to achieve the same burial depth. This in turn could require more space to store the excavated spoil. While we recognize these challenges are likely to necessitate additional right-of-way width at certain locations, the potential for these conditions in some wetlands does not justify widening the right-of-way in all wetlands in Massachusetts. Consequently, we deny Algonquin's request to use an 85-foot-wide construction right-of-way in all wetlands crossed by the I-10 Extension and Q-1 System Replacement. We would, however, reconsider Algonquin's request based on a site-specific analysis of each wetland area and its soils. Therefore, **we recommend that:**

- **Algonquin should revise its alignment sheets and E&SCP to be consistent with section VI.A.3 of the FERC Procedures, or prepare a site-specific analysis of each wetland area, including soils characteristics and other factors, that would justify use of a greater than 75-foot-wide right-of-way. Algonquin should file the revised alignment sheets and E&SCP or site-specific analysis of each wetland area with the Secretary <u>during the draft EIS comment period</u>.**

In addition to its request for a wider construction right-of-way, Algonquin identified certain areas where it believes site-specific conditions do not allow for a 50-foot setback of temporary extra workspace from wetlands. Table 4.4.3-1 lists the locations of these areas and the reasons why Algonquin believes a reduced setback is justified. The table also includes our decision to approve or deny Algonquin's request. Based on our review, it appears that the majority of Algonquin's requests are justified. However, we cannot approve Algonquin's request at 14 locations without additional justification. At 10 of these locations, near wetlands I10-W49, I10-WDEP1, I10-W50D, I10-W29, I10-WCC2, I10-WCC8, I10-WCC17 (2 times), I10-WCC18, and QB-1-31, a reduced setback appears unnecessary. Near wetland I10-W32 (the Scott Street crossing), we believe this workspace should be modified and narrowed by 20 feet to increase its distance from the wetland and preserve existing vegetation between the construction workspace and residences. Near the same wetland (the Sylvan Lake crossing), the workspace appears to extend unnecessarily into the lake. Near wetland I10-W50A, we consider the temporary extra workspace to be unnecessary because there appears to be adequate workspace on the opposite side of the right-of-way. Finally, we are unable to determine if the reduced setback for wetland E3-W50 near Hunter Brook is necessary because the filed drawings do not show the extent of the Shetucket River staging area relative to the adjacent wetland.

TABLE 4.4.3-1

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
Massachusetts					
I-10 Extension					
I10-W2 and I10-W3	1.2	1,015 x 70	0	Staging area for the Weymouth Fore River horizontal directional drill (HDD), rock storage, and to accommodate lower height spoil stockpiles due to working under powerlines.	Approved
I10-W3[a]	1.3	1,465 x 65	0	Staging area for fabrication of the pullback section for the Weymouth Fore River HDD. This workspace is also within 50 feet of waterbody I-3-S1 (see table 4.3.2-3).	Approved
I10-W4	1.6	155 x 110	10	Staging area for the Broad Street crossing and a wetland crossing.	Approved
I10-W45	2.3	180 x 70	0	Staging area for the Washington Street (Route 53) crossing and additional workspace for pipeline installation through a commercial parking lot.	Approved
I10-W6	2.4	1,940 x 60	0	Additional workspace for pipeline installation through a commercial parking lot, access road entry, and construction travel lane.	Approved
I10-W7	2.9	160 x 45	0	Staging area for the Front Street crossing and a wetland crossing.	Approved
I10-W8	2.9	485 x 75	10	Staging area for the Front Street crossing, a wetland crossing, and to maintain access between powerline tower structures.	Approved
I10-W49	3.9	910 x 35	20	Additional workspace for rock storage, wetland crossings, and travel lane around wetlands.	Additional Justification Needed
I10-W49A	4.3	355 x 50	5	Staging area for the MBTA Railroad, Grove Street, and Columbian Street crossings.	Approved
I10-WDEP1	4.4	185 x 50	40	Staging area for the Commerce Drive and MBTA Railroad crossings.	Additional Justification Needed
I10-W50A	4.4	275 x 60	0	Staging area for the Grove Street and Columbian Street crossings, wetland crossings, and to maintain a construction travel lane around existing powerline tower.	Approved
I10-W50A	4.4	185 x 15	10	Additional workspace for rock storage.	Additional Justification Needed

TABLE 4.4.3-1 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
I10-W50A	4.4	395 x 35	0	Additional workspace for wetland crossings, and to maintain a construction travel lane around an existing powerline tower.	Approved
I10-W50D	4.9	635 x 15	0	Additional workspace for rock storage.	Additional Justification Needed
I10-W23	5.2	120 x 50	25	Staging area for the Devon Woods Drive crossing and a wetland crossing.	Approved
I10-W23	5.2	115 x 55	10	Staging area for a wetland crossing and an access around existing powerline tower.	Approved
I10-W21 and I10-W20	5.3	1,520 x 55	0	Additional workspace for a wetland crossing, rock storage, to accommodate lower height spoil stockpiles due to working under powerlines, and access around existing powerline towers.	Approved
I10-W25	5.9	795 x 50	10	Additional workspace for wetland crossings, rock storage, to accommodate lower height spoil stockpiles due to working under powerlines, and access around existing powerline towers.	Approved
I10-W24	6.4	375 x 175	40	Staging area for the Pine Street crossing, access road entry, and a construction travel lane around existing powerline towers.	Approved
I10-W26	6.5	165 x 65	10	Staging area for the Pine Street crossing and a wetland crossing.	Approved
I10-W27[a]	6.7	200 x 60	0	Staging area for Damon Avenue, Tumbling Brook, and North Franklin Street crossings. This workspace is also within 50 feet of waterbody I10-27-S1 (see table 4.3.2-3).	Approved
I10-W27A	6.8	85 x 5	45	Staging area for the North Franklin Street crossing and a wetland crossing.	Approved
I10-W27A	6.8	1,040 x 15	0	Additional workspace for rock storage and wetland crossings.	Approved
I10-W29	7.0	460 x 15	20	Additional workspace for rock storage and a wetland crossing.	Additional Justification Needed

TABLE 4.4.3-1 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
I10-W32	7.6	785 x 45	15	Additional workspace for the Scott Street crossing, to accommodate lower height spoil stockpiles due to working under powerlines, access around existing powerline towers, and a wetland crossing.	Additional Justification Needed
I10-W32[a]	7.8	205 x 140	0	This wetland is associated with Sylvan Lake. This workspace is also within 50 feet of Sylvan Lake (see table 4.3.2-3).	Additional Justification Needed
I10-W33[a]	7.9	200 x 25	0	Staging area for the MBTA Railroad, Cochato River, and Mill Street crossings. This workspace is also within 50 feet of waterbody I10-33-S1 (Cochato River) (see table 4.3.2-3).	Approved
I10-W34	8.0	595 x 20	0	Additional workspace for the Fairfield Road crossing and a wetland crossing.	Approved
I10-W36	8.4	615 x 35	0	Additional workspace for a wetland crossing, severe side slope, and rock storage.	Approved
I10-W38	9.7	40 x 15	5	Staging area for a wetland crossing, the Three Swamp Brook crossing, and rock storage.	Approved
I10-W38	9.7	70 x 70	0	Additional workspace for rock storage and to cross a steep vertical slope.	Approved
I10-WCC1	10.8	95 x 70	0	Staging area for a wetland crossing and the Turnpike Street crossing.	Approved
I10-WCC2	10.9	155 x 15	0	Additional workspace for a wetland crossing and the Turnpike Street crossing.	Approved
I10-WCC2	10.9	100 x 65	0	Staging area for a wetland crossing and the Turnpike Street crossing.	Additional Justification Needed
I10-WCC20	11.0	100 x 50	0	Staging area for a wetland crossing.	Approved
I10-WCC11	11.1	100 x 15	45	Staging area for a wetland crossing and for rock storage.	Approved
I10-WCC8	11.4	100 x 50	45	Staging area for wetland crossings.	Approved
I10-WCC8	11.4	100 x 65	20	Staging area for a wetland crossing.	Additional Justification Needed
I10-WCC6 (Glen Echo Pond)	11.7	150 x 70	0	Staging area for hydrostatic testing activities and an access road entry.	Approved
I10-WCC17	11.9	1,770 x 15	15	Additional workspace for rock storage and moderate side slopes.	Additional Justification Needed

TABLE 4.4.3-1 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
I10-WCC17	12.2	875 x 15	10	Additional workspace for rock storage and moderate side slopes.	Additional Justification Needed
I10-WCC14	12.4	305 x 50	0	Staging area for a wetland crossing and equipment/ material storage.	Approved
I10-WCC18	12.5	1,305 x 15	25	Additional workspace for rock storage, moderate side slopes, and a wetland crossing.	Additional Justification Needed
QB-1-31	12.8	665 x 15	0	Additional workspace for rock storage.	Additional Justification Needed
Q-1 System Replacement					
QB-1-1	12.2	505 x 50	20	Staging area to support contractor mobilization/ demobilization and preparation of a level work area for installation of the proposed OPP Regulator Station and pig launcher/receiver.	Approved
QB-1-7	14.0	50 x 50	20	Staging area for a wetland crossing.	Approved
QB-1-7	14.1	80 x 50	30	Staging area for a wetland crossing.	Approved
QB-1-8	14.1	135 x 50	15	Staging area for a wetland/ unnamed intermittent stream crossing.	Approved
QB-1-11	15.4	175 x 85	0	Staging area for the Canton Road crossing and wetland crossings.	Approved
QB-1-11	15.5	100 x 50	0	Staging area for the MBTA Railroad crossing.	Approved
QB-1-12	15.6	140 x 50	0	Staging area for the MBTA Railroad crossing and wetland crossings.	Approved
QB-1-12	15.6	145 x 130	0	Staging area for remote blow-off valve installation.	Approved
QB-1-12	15.7	165 x 15	0	Additional workspace to accommodate lower height spoil stockpiles due to working under powerlines through wetlands and a crossover.	Approved
QB-1-12	15.7	410 x 30	0	Additional workspace to accommodate lower height spoil stockpiles due to working under powerlines through wetlands and a crossover.	Approved
QB-1-14	16.6	320 x 15	0	Staging area for a wetland crossing and to accommodate lower height spoil stockpiles due to working under powerlines.	Approved

TABLE 4.4.3-1 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
QB-1-14	16.7	260 x 115	10	Staging area for the Washington Street crossing and pipeline installation through a commercial parking lot.	Approved
QB-1-15	16.9	415 x 80	0	Additional workspace for rock storage and storage of spoil generated from grading side and vertical slopes.	Approved
QB-1-15	17.0	145 x 50	20	Staging area for wetland crossings.	Approved
QB-1-15A[a]	17.4	280 x 65	5	Staging area for the Greenbrook Drive crossing. This workspace is also within 50 feet of waterbody QB-15A-S1 (see table 4.3.2-3).	Approved
QB-1-17	17.8	115 x 250	45	Additional workspace for the New York-New Haven-Hartford Railroad crossing and a wetland crossing.	Approved
QB-1-25	18.7	330 x 50	30	Staging area for wetland crossings and topsoil segregation in a lawn area.	Approved
QB-1-28	19.1	100 x 50	10	Staging area for the John Road crossing and a wetland crossing.	Approved
QB-1-28	19.1	185 x 15	0	Additional workspace for access to staging area from John Road.	Approved
QB-1-30	19.4	165 x 50	15	Staging area for the Turnpike Street crossing and a wetland crossing.	Approved
QB-1-31	19.6	260 x 15	0	Staging area to support contractor mobilization/ demobilization and preparation of a level work area for installation of the proposed pig launcher/ receiver.	Approved
Connecticut					
E-3 System Replacement					
E3-W2	0.4	100 x 50	35	Staging area for the Bog Meadow Road crossing and a wetland crossing.	Approved
E3-W3[a]	0.6	100 x 50	15	Staging area for the Norwichtown Brook and Interstate 395 crossings. This workspace is also within 50 feet of waterbody E3-S2 (Norwichtown Brook) (see table 4.3.2-3).	Approved
E3-W4	0.6	110 x 50	10	Staging area for the Connecticut Turnpike crossing and a wetland crossing.	Approved
E3-W10	1.4	100 x 50	25	Staging area for the Reservoir Road crossing.	Approved

TABLE 4.4.3-1 (cont'd)

Areas Where Algonquin has Requested Temporary Extra Workspace In or Within 50 feet of Wetlands

State/Facility/ Wetland ID	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Justification	Approval Status
E3-W12	1.6	100 x 50	10	Staging area for the Canterbury Turnpike crossing and a wetland crossing.	Approved
E3-W50[a]	3.3	440 x 580	20	Staging area for the Shetucket River HDD. This workspace is also within 50 feet of waterbody E3-S5 (Hunter Brook) (see table 4.3.2-3).	Additional Justification Needed
E3-W19	3.9	1,320 x 60	0	Staging area for the Shetucket River HDD.	Approved
E3-W19	4.2	1,210 x 300	20	Additional workspace for topsoil segregation in an agricultural field and access road entry.	Approved
E3-W24	5.3	455 x 160	0	Staging area for an access road entry, a wetland crossing, and topsoil segregation in an agricultural field.	Approved
E3-W29	7.3	100 x 50	15	Staging area for the Branch Hill Road crossing and mainline valve installation.	Approved
E3-W28[a]	7.4	200 x 25	20	Staging area for a wetland crossing and topsoil segregation in an agricultural field. This workspace is also within 50 feet of waterbody E3-S14 (see table 4.3.2-3).	Approved
E3-W37[a]	9.0	200 x 50	15	Staging area for a wetland crossing/storage of stockpiled material from temporary stone wall removal. This workspace is also within 50 feet of Avery Pond (see table 4.3.2-3).	Approved
Bordering wetland associated with the Lake of Isles [a]	10.7	275 x 50	0	Staging area for an access road entry and access to a hydrostatic test water source. This workspace is also within 50 feet of the Lake of the Isles (see table 4.3.2-3).	Approved
E3-W44	11.0	190 x 50	10	Staging area to support contractor mobilization/ demobilization, preparation of a level work area for installation of the pig launcher/receiver, and access road entry.	Approved

[a] These wetlands are associated with waterbodies for which a request to locate extra workspace within 50 feet of the waterbody is needed (see table 4.3.2-3).

Based on our review of Algonquin's alignment sheets, it appears that there are 18 other areas where Algonquin proposes to use temporary extra workspace within 50 feet of wetlands but has not submitted a site-specific request. These areas are listed in table 4.4.3-2. If Algonquin proposes to use these areas as shown on the alignment sheets, it must submit a site-specific request and a site-specific explanation of the conditions that would not permit a 50-foot setback. Two of these wetlands are associated with waterbodies for which a request to locate extra workspace within 50 feet of the waterbody is needed (see table 4.4.3-2).

TABLE 4.4.3-2

Additional Areas Where Temporary Extra Workspaces are Located Within 50 feet of Wetlands

State/Facility/ Wetland ID [a]	Milepost	Size (feet (length by width))	Distance from Resource (feet)	Approval Status
Massachusetts				
I-10 Extension				
I10-W49 [b]	3.8	380 x 50	0	Pending submittal of a site-specific request and justification.
I10W23	5.2	95 x 15	0	Pending submittal of a site-specific request and justification.
I10-W36	8.4	~535 x 35	0	Pending submittal of a site-specific request and justification.
I10-W38D	10.2	~200 x 50	10	Pending submittal of a site-specific request and justification.
I10-WCC8	11.2	~100 x 65	45	Pending submittal of a site-specific request and justification.
I10-WCC7	11.5	~150 x 20	15	Pending submittal of a site-specific request and justification.
I10-WCC6	11.5	~1,675 x 15	20	Pending submittal of a site-specific request and justification.
I10-WCC6	11.8	~475 x 15	10	Pending submittal of a site-specific request and justification.
Q-1 System Replacement				
QB-1-7	13.7	740 x 50	5	Pending submittal of a site-specific request and justification.
QB-1-7	13.8	540 x 50	15	Pending submittal of a site-specific request and justification.
QB-1-15	16.9	500 x 105	25	Pending submittal of a site-specific request and justification.
QB-1-15	17.2	200 x 50	20	Pending submittal of a site-specific request and justification.
QB-1-15A [b]	17.4	250 x 60	0	Pending submittal of a site-specific request and justification.
Connecticut				
E-3 System Replacement				
E3-W19	4.0	190 x 50	20	Pending submittal of a site-specific request and justification.
E3-W22	4.9	125 x 50	20	Pending submittal of a site-specific request and justification.
E3-W23	5.3	150 x 50	45	Pending submittal of a site-specific request and justification.
E3-W29	7.2	680 x 50	25	Pending submittal of a site-specific request and justification.
E3-W34	8.2	100 x 50	5	Pending submittal of a site-specific request and justification.

[a] These temporary extra workspaces were identified during our review of alignment sheets as being within 50 feet of these wetlands.

[b] These wetlands also have associated waterbodies for which a request to locate extra workspace within 50 feet of the waterbody is needed (see table 4.3.2-4).

All of the extra workspaces listed in tables 4.4.3-1 and 4.4.3-2 are also listed in table E-1 in Appendix E and discussed in section 4.8.1. We are recommending in section 4.8.1 that Algonquin file additional justification for these extra workspaces with the Secretary during the draft EIS comment period.

4.4.4 Compensatory Mitigation

Algonquin has consulted with the New England District of the COE to discuss compensation for the permanent conversion of approximately 4.4 acres of forest wetland to scrub-shrub and emergent

wetland types, and the permanent fill of approximately 4,200 square feet of wetland for the permanent access road (PAR 12.24) located at the start of the Q-1 System Replacement in Massachusetts. Based on a March 21, 2008 meeting with the COE, Algonquin anticipates that the preferred mitigation would include "preservation" at a 1:15 compensation ratio. This compensation ratio is consistent with the COE's December 18, 2007 Public Notice entitled *Addendum to New England District Compensatory Mitigation Guidance: Compensation for Impacted Aquatic Resource Functions* and would equate to preservation of approximately a 67.5-acre site.

Algonquin has identified several potential sites within Massachusetts that may be suitable as mitigation for the entire Project pending concurrence with Connecticut resource agencies, the EPA, and the FWS. Algonquin's preferred site at this time is a 96-acre property (referred to by Algonquin as the Gibson Property or Glen Echo Property) that is crossed by the I-10 Extension between MPs 11.3 and 11.9. Algonquin has entered into a signed Agreement with the Town of Stoughton (Algonquin, 2008a). Under the terms of the Agreement and assuming Algonquin's proposed route is approved by the FERC, Algonquin has agreed to acquire and transfer the entire 96 acres of the site to the town. The town in turn has agreed to unconditionally support Algonquin's proposed pipeline route in Stoughton. Because Algonquin's intent and primary interest in the property is for wetland mitigation, a large portion of the property (46.2 acres) would be restricted by a conservation easement pursuant to Algonquin's COE permit and wetland mitigation requirements. Of this, 19.2 acres would compensate for wetland impacts and an additional 23.7 acres of upland forest would be protected by the conservation easement. Algonquin would retain a 50-foot-wide permanent easement across the property but has agreed to limit its future vegetation maintenance on the right-of-way to a 35-foot-wide strip. The remaining portion of the property would be conveyed to Stoughton and would be encumbered only by the town's enforceable conservation and/or open space and passive recreational limitations. The portion of the Property that would be conveyed to Stoughton includes 6.0 acres of wetlands.

As discussed above, preservation at a 1:15 ratio would require that 67.5 acres of wetland be protected as compensatory mitigation. Therefore, in addition to the Gibson Property, which would preserve 19.2 acres of wetlands, Algonquin is considering at least two other potential compensation sites and has initiated contacts with the respective landowners. To ensure that Algonquin develops a mitigation plan that appropriately compensates for Project-related wetland impacts, **we recommend that:**

- **Algonquin should file information regarding its compensatory wetland mitigation plan that includes:**

  a. a description of any additional sites under consideration to fulfill the 1:15 wetland preservation ratio required by the COE;

  b. the acreage of wetlands that would be preserved on each site;

  c. details of any conservation restrictions that would be placed on each site; and

  d. the comments of the COE on the compensatory wetland mitigation plan.

  Algonquin should file this information with the Secretary <u>during the draft EIS comment period</u>.

The COE has indicated that any conservation restrictions associated with Algonquin's compensatory wetland mitigation plan would need to be approved and in effect before the COE would issue its section 404 permit.

4.4.5 NSTAR Alternative

The impacts of construction and operation of the NSTAR Alternative would be similar to those described for the proposed pipeline route. The NSTAR Alternative would cross nine wetlands, including five palustrine forested, one palustrine scrub-shrub, and three palustrine emergent wetlands. Construction through these wetland areas would result in a total of 1.9 acres of temporary wetland impact comprising 1.2 acres of temporary impact on non-forested wetland types and 0.7 acre of impact on palustrine forested wetlands. This total is approximately 5.7 acres less than the acreage that would be affected by the corresponding segment of the proposed route. Because hydrologic conditions during operation would be returned to preconstruction conditions, there would be no permanent loss of wetlands. However, there would be a permanent conversion of approximately 0.2 acre of forested wetlands into emergent or scrub-shrub wetlands as a result of vegetation maintenance of the permanent cleared right-of-way. This value is less than the permanent conversion of wetland cover types that would result from the corresponding segment of the proposed route. Construction and operation of the NSTAR Alternative would also result in the use of two temporary access roads and one permanent access road. However, no impacts on wetlands would occur during construction or operation of these roads.

4.5 VEGETATION

4.5.1 Existing Vegetation Conditions

The proposed E2W Project is located within the Northeast Coastal Zone ecoregion (USGS, 2006b). Ecoregions are areas that have similar environmental resources and ecosystems that include climate, physiography, geology, hydrology, soils, vegetation, wildlife, and land uses (EPA, 2007b). The two dominant vegetation types that would be affected within this ecoregion are the central hardwoods-hemlock-white pine region and the transition hardwoods-white pine region (DeGraaf et al., 1992). The majority of the I-10 Extension and the Q-1 System Replacement and the entire E-3 System Replacement would cross the central hardwoods-hemlock-white pine forest type. The remainder of the I-10 Extension and the Q-1 System Replacement would cross the transition hardwoods-white pine forest type.

Many of the native vegetation communities within the Northeast Coastal Zone ecoregion have been altered by the expansion of urban, suburban, and agricultural areas. This has resulted in a number of non-forested vegetation types. The specific vegetation cover types that would be affected by the Project area are discussed below. Wetland vegetation communities that would be affected by the Project are discussed in section 4.4.1.1. A comprehensive list of common plant species within each vegetation community type is provided in table 4.5.1-1.

TABLE 4.5.1-1

Vegetation Cover Types Occurring Along the HubLine/East to West Project

Vegetation Community	General Description	Common Species	Location of Occurrence Within Project Area
Upland forest	Upland forest consists of two primary forest types: the central hardwoods-hemlock-white pine forests and the transition hardwoods-white pine forests.	The central hardwoods-hemlock-white pine forest type is dominated by populations of red oak, black oak, white oak, hickories, Eastern hemlock, and white pine. The transition hardwoods-white pine forest type is dominated by species such as sugar maple, red maple, yellow birch, paper birch, and American beech. The southern portion of this forest type includes oaks and hickories.	The central hardwoods-hemlock-white pine upland forest is found along the majority of the I-10 Extension and Q-1 System Replacement pipeline routes, along the entire E-3 System Replacement, at the Rehoboth Compressor Station, and at pipe storage and contractor ware yards in Connecticut. A portion of the transition hardwoods-white pine upland forest type is found along the I-10 Extension and Q-1 System Replacement.
Early successional-upland scrub-shrub	This vegetation community consists of all non-forested, non-wetland habitats including upland scrub-shrub, old fields, pasture, open land, agricultural land, herbaceous grasslands, utility rights-of-way, landscape, and residential/ developed land.	Common species found in these habitats include gray birch saplings, red cedar, common juniper, buckthorn, multiflora rose, sheep laurel, sweet fern, bracken fern, hayscented fern, Queen Anne's lace, lowbush blueberry, bayberry, meadowsweet, red clover, black-eyed susan, raspberries, greenbriars, various goldenrod species, grasses, and forbs.	Early successional-upland scrub-shrub habitats are located along all pipeline routes and access roads, at the Rehoboth Compressor Station, and at pipe storage and contractor ware yards.

Pipeline Facilities

The proposed pipeline routes would cross four distinct vegetation cover types: upland forest; wetland forest; early successional-upland scrub-shrub (which includes open land, open field communities, herbaceous grasslands, agriculture, scrub-shrub, and residential/developed land); and open, non-forested wetland vegetation communities. Table 4.5.1-1 lists the upland components of these cover types; provides general descriptions, including common vegetative species typical of each community; and identifies the Project facilities where each cover type occurs. As shown in table 4.5.1-1, all of the upland vegetative cover types occur along each of the proposed pipeline routes.

The primary vegetation cover type that would be crossed by the proposed pipeline facilities is the early successional-upland scrub-shrub cover type. This community covers about 50 percent of the pipeline routes. The next most prevalent vegetation cover type is upland forest, which covers about 32 percent of the pipeline routes. The remainder of the pipeline routes is covered by open, non-forested wetlands (10 percent) and forested wetlands (8 percent) (see section 4.4.1.1 for more discussion of these wetlands).

Aboveground Facilities

As previously discussed, Algonquin proposes to acquire a 97-acre parcel of land for the Rehoboth Compressor Station. Most of this 97-acre area is covered by forest land. The compressor station site and the associated staging area within this larger area consist of upland forest. Upland forest is also located along the entire length of both the suction and discharge lines from the compressor station to the existing G-5 and G-1 pipelines. The remaining aboveground facilities comprise open land, commercial/industrial, and upland forest land uses.

Pipe Storage and Contractor Ware Yards

Algonquin has identified six pipe storage and contractor ware yards that would be used on a temporary basis to facilitate construction activities. Approximately 9 percent of these sites is covered by early successional-upland scrub-shrub. The remainder of the sites consist of industrial/commercial land, which is bare or sparsely vegetated and not a representative cover type.

Access Roads

Early successional-upland scrub-shrub (open land, residential, and agriculture) comprises about 40 percent of the vegetation that would be affected by the access roads during construction. Forest land comprises about 20 percent of the vegetation that would be affected by access roads during construction. Industrial/commercial land, which is not a representative cover type, comprises the remaining 40 percent of the land within the footprint of the access roads.

4.5.2 General Impacts and Mitigation

Table 4.5.2-1 summarizes the approximate acreage of forest land and non-forest land that would be affected during construction and operation of each of the proposed pipeline facilities. Additional information on land use impacts is presented in section 4.8.1. Impacts on wetland vegetation are discussed in section 4.4.2.

TABLE 4.5.2-1

Acres of Vegetation Cover Types Affected by Construction and Operation of the Pipelines Associated with the HubLine/East to West Project [a]

	Upland Forest		Wetland Forest		Early Successional-Upland Scrub-Shrub [b]		Open, Non-forested Wetland		Total Forest		Total Early Successional and Open, Non-forested Wetland	
State/Facility	Const	Oper	Const	Oper [c]	Const	Oper	Const	Oper [c]	Const	Oper	Const	Oper
Massachusetts												
I-10 Extension	58.4	32.2	8.0	4.9	62.2	19.1	9.6	4.7	66.4	35.1	71.8	23.8
Q-1 System Replacement	10.9	3.2	4.9	2.1	45.4	24.4	16.2	10.1	15.8	4.4	61.6	34.5
Connecticut												
E-3 System Replacement	39.8	2.9	12.8	0.7	60.6	26.7	8.3	8.1	52.6	3.2	68.9	34.8
Pipeline Total	109.1	38.3	25.7	7.7	168.3	70.2	34.1	22.9	134.8	42.7	202.4	93.3

[a] Total acreage is equal to the sum of the acres of the four vegetative cover types. Total acres do not include open water and non-vegetated areas. Construction impacts include temporary extra workspace. Construction impacts are based on the proposed nominal 85-foot-wide construction right-of-way for the I-10 Extension and Q-1 System Replacement and a nominal 75-foot-wide construction right-of-way for the E-3 System Replacement. Construction impacts associated with the pipeline facilities include the existing permanent pipeline rights-of-way. Operation impacts are based on a 50-foot-wide permanent easement for the I-10 Extension and Q-1 System Replacement and a 30-foot-wide permanent easement for the E-3 System Replacement. Operation impacts include the areas outside of the existing maintained Algonquin pipeline right-of-way and/or the NSTAR powerline rights-of-way.

[b] This vegetation cover type includes upland scrub-shrub, old fields, pasture, open land, agricultural land, herbaceous grasslands, utility rights-of-way, landscape, and residential/developed land.

[c] The permanent right-of-way wetland acreage numbers represent the total area of wetland within the permanent easement that would be impacted during construction and not the wetland area that would be regularly maintained as part of the operation of the pipeline. For more information regarding wetland impacts for wetland areas that would be maintained as part of the proposed Project, refer to section 4.4.2.

Note: The totals in this table may not equal the sum of addends due to rounding.

Pipeline Facilities

Construction of the pipeline facilities would include temporary and permanent impacts on the vegetation cover types previously described. Approximately 7.7 miles (60 percent) of the proposed I-10 Extension would be within or adjacent to NSTAR's powerline right-of-way. Of these 7.7 miles, the I-10 Extension would be within the NSTAR right-of-way for approximately 3.9 miles, and outside but generally adjacent to the NSTAR right-of-way for the remaining 3.8 miles. The pipelines for the Q-1 System Replacement and the E-3 System Replacement would generally be installed in the same trenchline as the pipelines they would be replacing to the extent practicable. Algonquin's utilization of these existing rights-of-way would minimize impacts on vegetation by reducing the amount of land needed to be cleared for pipeline installation.

The pipeline right-of-way and temporary extra workspaces would be marked in the field prior to construction. The primary impact of the pipeline facilities on vegetation would be the cutting, clearing, and/or removal of existing vegetation everywhere within the delineated construction work areas to provide a safe working area for personnel and equipment. The degree of impact would depend on the type and amount of vegetation affected, the rate at which the vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted during operation. In general, the swath of vegetation that would be disturbed during construction would vary depending on the construction configuration, but would be between 75 and 85 feet, not including temporary extra workspace. About 51 percent of the vegetation disturbance associated with the proposed pipeline routes would be within Algonquin's and/or NSTAR's existing, previously disturbed rights-of-way. By locating the proposed pipelines within or adjacent to these existing rights-of-way, Algonquin would reduce the area of new disturbance and, therefore, would reduce impacts on vegetation. The remaining 49 percent of vegetation disturbance associated with construction would be outside the Algonquin or NSTAR existing rights-of-way.

Secondary effects associated with disturbances to vegetation could include increased soil erosion (see section 4.2.1.1), increased potential for the introduction and establishment of invasive weedy species (see sections 4.4.2 and 4.5.4), and a local reduction in available wildlife habitat (see section 4.6.1.2).

Construction of the proposed pipelines would disturb a total of about 337.2 acres of vegetation. Table 4.5.2-1 lists the amount of each vegetation cover type that would be affected by construction and operation of the proposed pipeline routes.

Where the right-of-way would need to be cleared for construction, trees would be cut into lengths, chipped, and/or removed to an approved site for sale or disposal. In temporary extra workspaces, tree stumps and rootstock would be left in place wherever possible to facilitate natural revegetation. Algonquin would also implement measures outlined in its E&SCP to minimize impacts on vegetation, including the installation of erosion control measures following initial disturbance of the soil.

Following construction, all of the previously vegetated workspace areas used during construction would be seeded and allowed to revegetate. Algonquin would maintain a 50-foot-wide permanent right-of-way for the I-10 Extension and Q-1 System Replacement. A 30-foot-wide permanent right-of-way would be maintained for the E-3 System Replacement. No further maintenance or disturbance associated with the pipeline would be conducted within the temporary extra workspaces. In accordance with its E&SCP, Algonquin would monitor all disturbed areas to determine the post-construction revegetative success for two growing seasons. The revegetation monitoring would also assess the establishment of undesirable exotic plant species. Algonquin has developed an Invasive Plant Species Control Plan (see section 4.5.4) in consultation with federal, state, and local agencies. Algonquin's Invasive Plant Species Control Plan is included in Appendix L.

After cleanup and reseeding of the right-of-way, the herbaceous components of the early successional-upland scrub-shrub cover type would typically regenerate quickly and impacts on this vegetation cover type would be short term. Cultivated areas are regularly disturbed, generally receive ample water through irrigation if necessary, and would quickly re-establish on the right-of-way following replanting by the landowners. Impacts on native grassland/herbaceous, utility rights-of-way, and old fields (also contained within the early successional cover type) would likely recover quickly considering the ample annual rainfall in the region. Impacts on these cover types during operation of the proposed pipelines would be minor because these cover types would be allowed to recover and would not be significantly altered by right-of-way maintenance activities. Any areas containing landscape cover (residential) would be replanted within the temporary construction right-of-way immediately after construction as part of site-specific plans and agreements with landowners with the exception of large-scale trees and shrubs that, due to availability, may not be able to be replaced with ones of comparable sizes. Additional information regarding impacts on and potential mitigation measures for residential areas, including landscaping, is presented in section 4.8.3.

Longer-term impacts would occur on woody shrubland cover because shrubland areas would be reseeded only with herbaceous species and the shrub species that would recolonize the right-of-way from adjacent areas would require several years to re-establish their woody canopy. Permanent impacts would occur on shrubland cover that is currently present within the permanent easement because the species would not regenerate the woody canopy present before construction due to periodic right-of-way maintenance activities.

The greatest impact would be on forested areas because of the time required to restore the woody vegetation to its preconstruction condition. Construction in forest lands would remove the large, mature tree canopy over the width of the construction right-of-way, which would change the structure and environment of the forest area. Permanent impacts would be greatest on the maintained portion of the permanent right-of-way where ongoing vegetation maintenance during operations would preclude the re-establishment of trees. The clearing of trees from the construction right-of-way could also affect the remaining trees along the edge of the right-of-way. Trees located on the edge of the right-of-way may be subject to mechanical damage to trunks and branches and root impacts from soil disturbance and compaction, all of which may result in the decreased health and viability of the remaining edge trees. Edge trees that were located within a dense stand of trees before construction may lack stability following removal of adjacent supporting trees, which may result in increased tree failures.

As discussed in section 4.4.4, Algonquin has identified several potential sites within Massachusetts that may be suitable compensatory mitigation for the entire Project pending concurrence with Connecticut resource agencies, the EPA, and the FWS. Algonquin's preferred site at this time is a 96-acre property (referred to by Algonquin as the Gibson Property or Glen Echo Property) that is crossed by the I-10 Extension between MPs 11.3 and 11.9. Algonquin has entered into an Agreement with the Town of Stoughton that would transfer the entire property to the town, and a large portion of the site would be protected by a conservation easement. Although Algonquin's primary intent in acquiring the site is for compensatory wetland mitigation, 23.7 acres of upland forest would be protected by the conservation easement.

Routine maintenance of the right-of-way would be required to allow continued access for routine pipeline patrols, maintaining access in the event of emergency repairs, and visibility during aerial patrols. In upland areas, maintenance of the right-of-way would involve clearing the entire right-of-way of woody vegetation. As such, the permanent rights-of-way would be subjected to mowing every 3 years. However, to facilitate periodic corrosion surveys a 10-foot-wide strip centered on the pipeline can be mowed annually to maintain herbaceous growth. Algonquin would not apply herbicides for general right-of-way maintenance.

The impacts on vegetation described above are based on the successful completion of two proposed HDD crossings, which would minimize impacts on vegetation. If these HDDs were not successful, Algonquin would propose alternative crossing methods that could increase the amount of impact on vegetative resources. Use of the HDD method would avoid approximately 1.8 acres of estuarine emergent marsh vegetation.

Aboveground Facilities

Construction of the Rehoboth Compressor Station and associated facilities would disturb about 18.1 acres of upland forest on the 97-acre property Algonquin proposes to acquire for the site. As discussed above, the majority of this 97-acre property is forest land. The areas disturbed by the footprint of the Project facilities would include approximately 8.1 acres of forest on the compressor station site, an additional 4.4 acres of forest adjacent to the compressor station site for temporary staging and extra workspace needed to construct the compressor station, 4.3 acres of forest along the length of the suction and discharge lines to the existing G-5 and G-1 pipelines, and 1.3 acres of forest for the compressor station access road. Following construction, 11.6 acres of the disturbed area would be retained (and maintained) for operation of the facility. The 8.1 acres of permanently maintained area at the compressor station and the 1.3 acres of permanently maintained area along the access road would be converted to commercial industrial land. The 2.2 acres of permanent right-of-way along the suction and discharge lines would be maintained in a grassy or herbaceous condition. The remaining 85.4 acres of the property would be preserved as screening and buffering for the compressor station or potentially used as conservation or mitigation areas.

Construction of the remaining aboveground facilities would affect 11.1 acres of land including 4.7 acres of upland forest. Construction and operation of the aboveground facilities would permanently convert 1.5 acres of upland forest to commercial/industrial uses.

Algonquin would implement measures outlined in its E&SCP to minimize disturbance to vegetation at the Rehoboth Compressor Station and the OPP regulator stations during construction, and revegetate with grasses those areas not permanently disturbed during operation of these facilities.

Pipe Storage and Contractor Ware Yards

Some maintenance may be required at the proposed pipe storage and contractor ware yards to remove brush, prune trees, and remove other herbaceous vegetation for safe passage of equipment and to prepare a work surface for the storage of pipe and other construction materials. Algonquin estimates these activities would temporarily disturb about 5.9 acres of early successional-upland scrub-shrub (open land). Following construction, these previously vegetated open land areas would be restored and reseeded as appropriate in accordance with landowner agreements.

Access Roads

To the extent practicable, Algonquin proposes to use existing public and private road crossings along the proposed pipeline routes to access the right-of-way. Algonquin also plans to use the existing access roads that run along and within many of the established rights-of-way where the proposed facilities would be located. Algonquin's use of existing access roads during construction would minimize impacts on vegetation communities. However, some upgrades to existing access roads may be required to allow safe access. These upgrades are expected to include some brush removal and tree trimming. Algonquin estimates that these activities would temporarily disturb about 5.7 acres of early successional-upland scrub-shrub vegetation (open land, residential and agriculture) and about 2.8 acres of forest land (including the Rehoboth Compressor Station access road). Of the 2.8 acres of forest land, approximately

0.3 acre is forested wetland vegetation. The remaining areas along access roads would affect about 5.6 commercial/industrial land use.

Three new permanent access roads would be constructed. A full description of access roads required for the proposed Project is provided in section 4.8.1. The new permanent access road proposed at the start of the Q-1 System Replacement (PAR 12.24) in Sharon, Massachusetts would require the filling of approximately 0.1 acre of forested wetland. Algonquin would mitigate impacts resulting from new access road construction by implementing the measures outlined in its E&SCP. Mitigation for the permanent impact of 0.1 acre of forested wetland from the operation of the new permanent access road would be achieved through compensatory mitigation at a "preservation" ratio of 1:15 (see section 4.4.4 for a more detailed discussion of compensatory wetland mitigation).

4.5.3 Vegetation Communities of Special Concern or Value

Algonquin consulted with federal and state resource agencies to determine if any federally or state-listed endangered or threatened plant species (including federal and state species of special concern) or their designated communities occur within the proposed E2W Project area.

Massachusetts

In Massachusetts, Algonquin's review of the MassNHESP and available MassGIS information did not result in the identification of any unique, sensitive, or protected vegetation along the I-10 Extension. However, the I-10 Extension would cross several miles of the Cranberry Brook Watershed ACEC. Algonquin and the FERC received comments expressing concern about the crossing of this area and the need to investigate alternatives that would avoid or minimize the impact on the ACEC. We evaluated three alternatives to address these concerns (see section 3.4.1).

Construction activities within the Cranberry Brook Watershed ACEC would affect approximately 8.0 acres of wetland and upland forest and approximately 8.5 acres of early successional-upland scrub-shrub cover. Algonquin would implement measures outlined in its E&SCP to reduce impacts on vegetation within the construction and permanent rights-of-way to improve revegetation potential. Algonquin's E&SCP incorporates many of the mitigation measures outlined in the FERC Plan as well as agency-recommended revegetation and erosion control procedures.

Algonquin is in the process of consulting with the MassNHESP and the MassDCR and is conducting research to identify an appropriate and available native seed mix that could be used in the Cranberry Brook Watershed ACEC area to promote the revegetation of the right-of-way with native herbaceous species while also quickly stabilizing the soil and providing erosion and sedimentation control. Based on field surveys, Algonquin has confirmed the presence of well established and pervasive non-native species such as purple loosestrife, European buckthorn, and common reed throughout the Cranberry Brook Watershed ACEC. Therefore, the potential to prevent the spread of non-native invasive species is limited in nature, because the available seed bank throughout the alignment in the ACEC would contain non-native species that would likely germinate and re-establish after construction is complete. Algonquin would implement measures outlined in its Invasive Plant Species Control Plan and would utilize a native seed mix to help minimize the re-establishment of non-native species. To ensure selection of a seed mix that is consistent with agency recommendations, **we recommend that:**

- **Algonquin should file a description of the native seed mix that would be used in the Cranberry Brook Watershed ACEC along with the comments of the MassNHESP and the MassDCR on the selected seed mix with the Secretary <u>prior to construction across the ACEC</u>.**

During its field surveys, Algonquin identified a stand of Atlantic white cedar within the Cranberry Brook Watershed ACEC. The Atlantic white cedar stand is part of a larger red maple swamp and scrub-shrub wetland associated with Cranberry Pond at MP 5.6. In Massachusetts, Atlantic white cedar bogs are considered a unique plant community that is ranked an S2 community, indicating that there are 6 to 20 occurrences state-wide. Atlantic white cedar tends to grow in acidic swamps and bogs often covered below with a mat of sphagnum moss. These swamps are commonly found at low elevations in basins overlying sand and gravel deposits or glacial lake bottom sediments and are generally limited to coastal regions of Massachusetts (Swain et al., 2001). Species typically found in this plant community include Atlantic white cedar, which is the dominant tree species, as well as red maple, pitch pine, white pine, and hemlock, all of which may be co-dominants. Understory species typically consist of a dense shrub layer that includes high bush blueberry, swamp azalea, sweet pepperbush, and fetterbush (Swain et al., 2001).

In its application, Algonquin incorporated a minor route variation that avoids this stand of Atlantic white cedar (see section 3.5).

Based on information Algonquin received from the MassNHESP and reviews of the MassGIS data, no areas of unique, sensitive, or protected vegetation along the proposed Q-1 System Replacement were identified. However, during an interagency meeting sponsored by Algonquin, the Massachusetts Audubon Society indicated that habitat for the state-endangered dwarf rattlesnake plantain was identified on its property within the Moose Hill Wildlife Sanctuary in Sharon, Massachusetts (Massachusetts Audubon Society, 2007) (see discussion of dwarf rattlesnake plantain in section 4.7.3).

Based on information received from the MassNHESP and reviews of the MassGIS database, no unique, sensitive, or protected vegetation is known to occur at the Rehoboth Compressor Station site.

Connecticut

According to information received from the Connecticut Natural Diversity Data Base (CTNDDB), the E-3 System Replacement would cross a mapped significant natural community area designated as an acidic Atlantic white cedar basin swamp. On October 10, 2007, Algonquin and the CTDEP Wildlife Division conducted a field review of the designated Atlantic white cedar swamp community area to assess the existing community and to conduct a field survey for state-protected plant species. The E-3 System Replacement would be installed within the existing Algonquin right-of-way in this area and no Atlantic white cedar trees were observed within or adjacent to the existing pipeline right-of-way. In addition, no federally or other state-protected plant species were observed (Murray, 2007). As such, no significant natural communities would be affected by the E-3 System Replacement.

4.5.4 Noxious Weeds and Other Invasive Plant Species

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out compete desirable native species, and thereby decrease overall species diversity. Noxious weeds often invade and persist in areas after disturbance (e.g., after construction of a pipeline) and can hinder restoration. Other aggressive plant species, both native and introduced, may also out compete desirable native and other beneficial species. Noxious weeds are addressed by Executive Order 13112 (February 1999), which directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause. The order further specifies that a federal agency shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has determined that the benefits of such actions outweigh the potential harm caused

by invasive species and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions.

In accordance with its E&SCP, Algonquin would monitor all disturbed areas to determine the post-construction revegetative success for two growing seasons. The revegetation monitoring would also assess the establishment of undesirable exotic plant species.

Algonquin conducted surveys for the presence of invasive species during its wetland delineations and developed an Invasive Plant Species Control Plan that would be implemented during construction and operation of the proposed Project (see Appendix L). This plan contains a list of wetlands where invasive wetland plant species were observed during wetland surveys. The plan describes construction-phase mitigation, post-construction monitoring, and remediation that would be implemented to control the spread of invasive wetland plant species. The plan focuses on controlling the spread of two foreign and invasive wetland plant species, purple loosestrife and common reed, that have been identified by federal and state agencies as the most prevalent nuisance species within the proposed Project area. The CTDEP indicated that common reed occurs between MPs 6.6 and 7.3 of the E-3 System Replacement in the mapped Atlantic white cedar swamp natural community that is discussed in section 4.5.3 above. The CTDEP believes this common reed could be managed and eradicated and has recommended pre- and post-construction applications of herbicides. Algonquin has not yet agreed to this recommendation but has indicated that it would continue to consult with the CTDEP to develop appropriate measures to control common reed at this location.

4.5.5 NSTAR Alternative

The vegetative communities identified along the NSTAR Alternative are expected to be similar to those found along the proposed I-10 Extension and Q-1 System Replacement. The temporary and permanent impacts on cover types found along the NSTAR Alternative would be similar to those described for the proposed route but on a slightly different scale. There are no known vegetation communities of special concern along the alternative.

The predominant cover type that would be crossed by the NSTAR Alternative is early successional-upland scrub-shrub vegetation (open land, fields, rights-of-way, etc.), that comprises approximately 20.7 acres of the vegetation cover types along the alternative, compared to approximately 2.9 acres of this vegetative cover type along the corresponding segment of the proposed route. Construction of the NSTAR Alternative would also temporarily disturb approximately 6.8 acres of upland forest land, which is about 22.1 fewer acres of upland forest than would be affected by the corresponding segment of the proposed route. Similarly, wetlands impacts associated with the NSTAR Alternative would be less than those for the corresponding segment of the proposed route. The alternative would impact a total of 1.9 acres of wetland vegetation including approximately 0.7 acre of forested wetland. This compares to a total of 7.6 acres of wetland vegetation including approximately 4.5 acres of forested wetland along the corresponding segment of the proposed route.

The NSTAR Alternative would be parallel to existing rights-of-way for approximately 1.4 miles and would create approximately 1.3 miles of new permanent right-of-way. This compares to about 1.1 miles of existing right-of-way and the creation of 2.4 miles of new permanent right-of-way for the corresponding segment of the proposed route.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife

The E2W Project would cross terrestrial and wetland habitats that support a diversity of wildlife species. In general, the composition, structure, and distribution of a plant community in an area are referred to as vegetative cover. Wildlife species are directly dependent on the existing plant communities and would be attracted to an area if suitable cover or habitat is present.

4.6.1.1 Existing Wildlife Resources

Pipeline Facilities

As described in sections 4.4.1 and 4.5.1, the proposed pipelines would cross several distinct upland and wetland vegetation cover types. These include upland forest, early successional-upland scrub-shrub (which includes upland scrub-shrub, old fields, pasture, open land, agricultural land, herbaceous grasslands, utility rights-of-way, landscape, and residential/developed land), forested wetland, open, and non-forested wetland (includes scrub-shrub, emergent, and estuarine wetlands). Each of these cover types (i.e., vegetation communities) provides nesting, cover, and foraging habitat for a variety of wildlife species. Other resources including open water also provide many of these same functions for wildlife species. Impacts on open water resources are described in section 4.3.2.2. Table 4.6.1-1 identifies the wildlife species that are common to these habitats. The most prevalent wildlife habitat within the Project area is early successional-upland scrub-shrub communities, which account for approximately 50 percent of the wildlife habitat that would be affected by the proposed Project. Upland forest habitat, which provides some of the greatest vertical structure and supports diverse faunal assemblages, accounts for about 32 percent of the wildlife habitat that would be affected, followed by open, non-forested wetlands habitat at 10 percent. Forested wetland accounts for approximately 8 percent of the wildlife habitat that would be affected by the Project, while open water constitutes less than 1 percent of the wildlife habitat.

Aboveground Facilities

The Rehoboth Compressor Station site is located in the Town of Rehoboth, Massachusetts, approximately 1,000 feet south of and 1,350 feet east of Algonquin's existing G-1 and G-5 systems, respectively. Most of the 97-acre area that would be acquired for the Rehoboth Compressor Station is covered by forest land. The compressor station site and the associated staging area consist of upland forest wildlife habitat. Upland forest wildlife habitat is also located along the entire length of both the suction and discharge lines to the existing G-5 and G-1 pipelines and the compressor station access road. The remaining aboveground facilities comprise early successional-upland scrub-shrub (open land), commercial/industrial, and upland forest land uses.

TABLE 4.6.1-1

Typical Wildlife Species Found Within the Vegetation Communities Crossed by the HubLine/East to West Project

Vegetation Communities	Typical Wildlife Found within the Vegetation Communities
Early Successional-Upland Scrub-Shrub [a]	**Amphibians:** spotted salamander, red-spotted newt, Eastern American toad, wood frog, pickerel frog. **Reptiles:** Northern brown snake, Eastern garter snake, Eastern hognose snake, Northern black racer, Eastern smooth green snake, Eastern milk snake, Eastern box turtle. **Birds:** turkey vulture, red-tailed hawk, rough-legged hawk, American kestrel, ring-necked pheasant, mourning dove, yellow-billed cuckoo, common nighthawk, chimney swift, Northern bobwhite, American woodcock, killdeer, Eastern screech-owl, ruby-throated hummingbird, Northern flicker, alder flycatcher, willow flycatcher, Eastern kingbird, purple martin, tree swallow, Northern rough-winged swallow, bank swallow, cliff swallow, barn swallow, blue jay, American crow, black-capped chickadee, house wren, blue-gray gnatcatcher, Eastern bluebird, American robin, gray catbird, Northern mockingbird, brown thrasher, Northern shrike, European starling, red-eyed vireo, blue-winged warbler, yellow-rumped warbler, yellow warbler, chestnut-sided warbler, prairie warbler, common yellowthroat, yellow-breasted chat, Northern cardinal, indigo bunting, Eastern towhee, American tree sparrow, chipping sparrow, field sparrow, song sparrow, white-throated sparrow, dark-eyed junco, bobolink, common grackle, Eastern meadowlark, brown-headed cowbird, American goldfinch, house sparrow. **Mammals:** Virginia opossum, masked shrew, smoky shrew, Northern short-tailed shrew, hairy-tailed mole, little brown myotis, Keen's myotis, Eastern cottontail, New England cottontail, Eastern chipmunk, woodchuck, Southern red-backed vole, meadow vole, meadow jumping mouse, coyote, red fox, gray fox, raccoon, ermine, long-tailed weasel, striped skunk, white-tailed deer, bobcat.
Upland Forest [b]	**Amphibians:** spotted salamander, red-spotted newt, Northern dusky salamander, Northern two-lined salamander, Eastern American toad, Fowler's toad, Northern spring peeper, gray treefrog, wood frog. **Reptiles:** Eastern box turtle, northern brown snake, Northern redbelly snake, Eastern garter snake, Eastern hognose snake, northern black racer, Eastern milk snake. **Birds:** turkey vulture, hooded merganser, common merganser, Northern goshawk, broad-winged hawk, red-shouldered hawk, ruffed grouse, wild turkey, mourning dove, black-billed cuckoo, yellow-billed cuckoo, Eastern screech-owl, great horned owl, barred owl, whip-poor-will, ruby-throated hummingbird, red-headed woodpecker, yellow-bellied sapsucker, hairy woodpecker, downy woodpecker, Northern flicker, pileated woodpecker, Eastern wood-pewee, least flycatcher, great crested flycatcher, blue jay, American crow, black-capped chickadee, tufted titmouse, white-breasted nuthatch, brown creeper, winter wren, house wren, golden-crowned kinglet, blue-gray gnatcatcher, veery, wood thrush, gray catbird, cedar waxwing, brown thrasher, blue-headed vireo, yellow-throated vireo, warbling vireo, Nashville warbler, black-throated green warbler, pine warbler, black and white warbler, American redstart, ovenbird, Northern waterthrush, scarlet tanager, Northern cardinal, rose-breasted grosbeak, Baltimore oriole, pine siskin, evening grosbeak. **Mammals:** Virginia opossum, masked shrew, smoky shrew, Northern short-tailed shrew, hairy-tailed mole, little brown myotis, Keen's myotis, big brown bat, silver-haired bat, Eastern pipistrelle, red bat, hoary bat, Eastern cottontail, New England cottontail, Eastern chipmunk, woodchuck, gray squirrel, red squirrel, Northern flying squirrel, white-footed mouse, Southern red-backed vole, woodland vole, woodland jumping mouse, coyote, red fox, gray fox, raccoon, ermine, long-tailed weasel, mink, striped skunk, white-tailed deer, bobcat.
Forested Wetland	**Amphibians:** spotted salamander, Jefferson salamander, Tremblay's salamander, Northern dusky salamander, red-backed salamander, Northern spring salamander, Northern two-lined salamander, Eastern American toad, Fowler's toad, Northern spring peeper, gray treefrog, green frog, red-spotted newt, wood frog, pickerel frog, Northern leopard frog. **Reptiles:** Common snapping turtle, Northern water snake, Northern brown snake, Northern redbelly snake, Eastern ribbon snake, Eastern garter snake, Northern ringneck snake, Eastern milk snake, Northern black racer. **Birds:** Great blue heron, green-backed heron, wood duck, American black duck, common goldeneye, bufflehead, hooded merganser, common merganser, Northern goshawk, red-shouldered hawk, red-tailed hawk, ruffed grouse, wild turkey, American woodcock, yellow-billed cuckoo, Eastern screech-owl, Great-horned owl, barred owl, ruby-throated hummingbird, red-bellied woodpecker, downy woodpecker, hairy woodpecker, pileated woodpecker, Eastern wood-pewee, alder flycatcher, willow flycatcher, least flycatcher, great-crested flycatcher, blue jay, American crow, black-capped chickadee, tufted titmouse, white-breasted nuthatch, golden-crowned kinglet, blue-gray gnatcatcher, veery, wood thrush, gray catbird, brown thrasher, cedar waxwing, blue-headed vireo, yellow-throated vireo, warbling vireo, Nashville warbler, yellow warbler, black-throated blue warbler, black and white warbler, American redstart, hooded warbler, ovenbird, Northern waterthrush, common yellowthroat, Canada warbler, scarlet tanager, Northern cardinal, rose-breasted grosbeak, Eastern towhee, swamp sparrow, white-throated sparrow, common grackle, Orchard oriole, Northern Oriole.

TABLE 4.6.1-1 (cont'd)

Typical Wildlife Species Found Within the Vegetation Communities Crossed by the HubLine/East to West Project

Vegetation Communities	Typical Wildlife Found within the Vegetation Communities
	Mammals: Virginia opossum, masked shrew, smoky shrew, Northern short-tailed shrew, star-nosed mole, little brown myotis, Keen's myotis, big brown bat, silver-haired bat, Eastern pipistrelle, red bat, hoary bat, Eastern cottontail, New England cottontail, Eastern chipmunk, gray squirrel, red squirrel, beaver, Northern flying squirrel, white-footed mouse, Southern red-backed vole, woodland vole, woodland jumping mouse, coyote, red fox, gray fox, raccoon, ermine, long-tailed weasel, mink, river otter, striped skunk, white-tailed deer, bobcat.
Scrub-shrub Wetland	**Amphibians:** spotted salamander, Jefferson salamander, red-spotted newt, Eastern American toad, Northern spring peeper, gray treefrog, green frog, American bullfrog, wood frog.
	Reptiles: Common snapping turtle, painted turtle, spotted turtle, Northern water snake, Northern brown snake, Northern redbelly snake, Eastern ribbon snake, Eastern garter snake, Eastern milk snake, Northern black racer, Eastern smooth green snake.
	Birds: Great blue heron, green-backed heron, yellow-crowned night-heron, black-crowned night-heron, wood duck, glossy ibis, American black duck, mallard, red-shouldered hawk, rough-legged hawk, American kestrel, sora, American woodcock, black-billed cuckoo, Great horned owl, alder flycatcher, willow flycatcher, tree swallow, barn swallow, Northern rough-winged swallow, winter wren, house wren, blue-gray gnatcatcher, gray catbird, cedar waxwing, blue-winged warbler, yellow warbler, chestnut-sided warbler, Northern waterthrush, Louisiana waterthrush, common yellowthroat, Canada warbler, yellow-breasted chat, Northern cardinal, American tree sparrow, song sparrow, swamp sparrow, white-throated sparrow, red-winged blackbird, common grackle, orchard oriole.
	Mammals: Virginia opossum, masked shrew, Northern short-tailed shrew, star-nosed mole, little brown myotis, Keen's myotis, big brown bat, silver-haired bat, Eastern pipistrelle, red bat, hoary bat, Eastern cottontail, New England cottontail, beaver, white-footed mouse, Southern red-backed vole, meadow vole, muskrat, meadow jumping mouse, coyote, red fox, gray fox, raccoon, ermine, long-tailed weasel, mink, river otter, striped skunk, white-tailed deer, bobcat.
Emergent Freshwater Wetland	**Amphibians:** spotted salamander, Jefferson salamander, red-spotted newt, Northern dusky salamander, Eastern American toad, Northern spring peeper, gray treefrog, bullfrog, green frog, pickerel frog, wood frog, Northern leopard frog.
	Reptiles: Common snapping turtle, painted turtle, spotted turtle, Northern water snake, Northern brown snake, Northern redbelly snake, Eastern ribbon snake, Eastern garter snake, Northern black racer, Eastern smooth green snake.
	Birds: Great blue heron, green-backed heron, yellow-crowned night-heron, black-crowned night-heron, wood duck, glossy ibis, mute swan, Canada goose, green-winged teal, American black duck, mallard, Northern pintail, blue-winged teal, Northern shoveler, gadwall, hooded merganser, rough-legged hawk, American kestrel, Virginia rail, sora, American coot, killdeer, belted kingfisher, American woodcock, ring-billed gull, chimney swift, purple martin, tree swallow, barn swallow, Northern rough-winged swallow, bank swallow, cliff swallow, fish crow, marsh wren, sedge wren, Northern shrike, common yellowthroat, American tree sparrow, savannah sparrow, swamp sparrow, bobolink, red-winged blackbird, Eastern meadowlark, common grackle.
	Mammals: Virginia opossum, masked shrew, Northern short-tailed shrew, star-nosed mole, little brown myotis, Keen's myotis, big brown bat, silver-haired bat, Eastern pipistrelle, red bat, hoary bat, Eastern cottontail, New England cottontail, beaver, white-footed mouse, meadow vole, muskrat, meadow jumping mouse, coyote, red fox, gray fox, raccoon, log-tailed weasel, mink, striped skunk, river otter, white-tailed deer, bobcat.
Estuarine Emergent Wetland (Coastal Wetland/Intertidal Zone)	**Amphibians:** Northern leopard frog.
	Birds: Great blue heron, green-backed heron, yellow-crowned night-heron, black-crowned night-heron, glossy ibis, mute swan, Canada goose, green-winged teal, American black duck, mallard, Northern pintail, blue-winged teal, Northern shoveler, gadwall, common goldeneye, bufflehead, red-breasted merganser, osprey, rough-legged hawk, Virginia rail, sora, American coot, killdeer, ring-billed gull, herring gull, great black-backed gull, belted kingfisher, tree swallow, barn swallow, American crow, fish crow, marsh wren, savannah sparrow, red-winged blackbird.
	Mammals: Virginia opossum, Northern short-tailed shrew, star-nosed mole, little brown myotis, Keen's myotis, meadow vole, muskrat, meadow jumping mouse, coyote, red fox, raccoon, long-tailed weasel, mink, striped skunk, river otter, white-tailed deer.
Open Water	Wildlife species found in open water habitats are similar to those found in emergent freshwater marsh and estuarine emergent wetlands.

[a] Includes upland scrub-shrub, old fields, pasture, open land, agricultural land, herbaceous grasslands, utility rights-of-way, landscape, and residential/developed land.

[b] Includes the central hardwoods-hemlock-white pine region and transition hardwoods-white pine region. The wildlife species listed are common to both specific forest community types.

Pipe Storage and Contractor Ware Yards

Algonquin has identified six pipe storage and contractor ware yards that would be used on a temporary basis to facilitate construction activities. Most (about 91 percent) of these sites are previously disturbed and support little vegetation. These areas would provide only minimal habitat for wildlife in the Project area. The remaining area of the pipe storage and contractor ware yards comprises early successional-upland scrub-shrub (open land). No forested wildlife habitat would be affected by use of these facilities.

Access Roads

About 40 percent of the wildlife habitat that would be affected by the proposed access roads is early successional-upland scrub-shrub (open land, residential, and agriculture). The next most prevalent wildlife habitat (comprising about 20 percent of the total) is forest land. The remaining area along the access roads (about 40 percent of the total) is industrial/commercial land, which is not a representative cover type, and provides little if any wildlife habitat.

4.6.1.2 General Impacts and Mitigation

Pipeline Facilities

The impact of the proposed Project on wildlife species and their habitats would vary depending on the requirements of each particular species and the existing habitat present along the proposed pipeline routes. The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction.

Direct impacts of construction on wildlife would include the displacement of wildlife on the right-of-way and direct mortality of some individuals. It is expected that wildlife, such as birds and larger mammals would leave the vicinity of the right-of-way as construction activities approach. Depending on the season, construction could also disrupt bird courting or nesting and breeding of other wildlife on and adjacent to the right-of-way. Many of these animals may relocate into similar habitats nearby; however, the lack of adequate territorial space could force some animals into suboptimal habitats. This could increase inter- and intra-specific competition and lower reproductive success and survival. The influx and increased density of animals in some undisturbed areas caused by these dislocations could also reduce the reproductive success of animals that are not displaced by construction. Additionally, some smaller, less mobile wildlife, such as small mammals and burrowing species (e.g., opossums, mice, voles, weasels, and beaver), amphibians, and reptiles, could be crushed by construction equipment or trapped in trenches. Bird nests located within the construction work area could be destroyed by clearing activities. The loss of these species could result in a decrease in the food stock available for predators of these species. These effects, however, would cease after construction, and it is expected that wildlife would return to the disturbed areas and adjacent, undisturbed habitats after right-of-way restoration is completed.

Habitat conversion affects wildlife species differently depending on individual species' habitat preferences. Wildlife species most likely to be adversely affected by the proposed Project are those that are dependent upon forest interiors, particularly several species of neotropical migrant and ground-nesting birds. Examples of these species include wood thrush, black-throated green warbler, ovenbird, red-eyed vireo, northern waterthrush, and scarlet tanager. Conversion of forested habitats to early successional stages, forest fragmentation, and the increase in forest/field edge that results are believed to adversely affect these species by causing: increased rates of nest predation; increased rates of brood parasitism;

increased interspecific competition; reductions in pairing success; and reductions in nesting areas (Faaborg et al., 1992). The impacts on migratory bird species would be similar to those described for other wildlife; however, the long-term impacts associated with the proposed Project could be beneficial for many of these species. Because the majority of the proposed pipeline facilities would be located within or adjacent to Algonquin's and/or NSTAR's existing rights-of-way, impacts on forest-dwelling migratory songbirds would not be significant. In fact, some species of resident and migratory wildlife use existing utility corridors as preferred habitat. Assuming that revegetation of the right-of-way is successful, many of these species (edge nesting and foraging species and early successional nesting species) would benefit from the additional forage material within the right-of-way or from the presence of prey species that would utilize the forage material as well as newly created nesting habitat within the right-of-way. Mammals that are dependent on forest interiors are relatively few in numbers and may not occur widely in the proposed Project area because a substantial portion of the routes cross developed urban and suburban landscapes and are located within existing Algonquin rights-of-way and/or adjacent to or partially within other existing utility rights-of-way (e.g., NSTAR's powerline right-of-way). Other mammals that could be adversely affected include those that are arboreal (e.g., several bat and squirrel species). Conversion of forested habitats would also reduce the area of habitat available for woodland amphibians such as the spotted salamander and wood frog.

Indirect wildlife impacts associated with construction noise and increased activity should be temporary and could include abandoned reproductive efforts, displacement, and avoidance of work areas.

In total, the proposed pipelines would impact approximately 109.1 acres of upland forested habitat. The effect on forested habitats would be greater than on non-forested areas because forest lands take longer to regenerate and would be prevented from re-establishing over the permanent right-of-way by periodic vegetation maintenance during operation of the proposed pipelines. Construction of the pipelines would also disturb about 168.3 acres of early successional-upland scrub-shrub habitats. The impact on these habitats would be less than on upland forest lands but regeneration of some of these areas could take 3 years or more. Although the structural component of shrub-dominated habitats would recover slowly, successful restoration of non-woody vegetation may improve the value of forage for some wildlife within a relatively short time. In general, these effects are not expected to have an impact on wildlife populations because the amounts of the habitats that would be affected are relatively minor and are adjacent to existing maintained utility corridors. These existing rights-of-way are routinely maintained as part of regular facility operations to control vegetative growth thus establishing shrub and/or open field wildlife habitats.

As described in section 4.4, construction of the proposed pipelines would also affect approximately 59.8 acres of wetland, including 25.7 acres of forested wetland habitat. Approximately 7.7 acres of forested wetland habitat lies within the permanent easement, of which 4.4 acres would be permanently affected by routine vegetation maintenance during operation of the pipeline facilities.

Disturbance to these habitats would be minimized through implementation of Algonquin's E&SCP, which includes measures to reseed disturbed areas with seed mixes determined in accordance with landowner agreements, permit requirements, and consultations with agency and non-agency stakeholders. The rights-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting. A combination of both summer and winter cover would be established along the right-of-way to encourage wildlife usage throughout the year.

To minimize construction impacts on wetlands, we recommended in section 4.4.3 that the construction right-of-way through wetlands be reduced to 75 feet. Additionally, the COE would require compensatory mitigation for impacts on wetland habitats (see section 4.4.4). Disturbances to open water habitats would generally not have lasting effects following the completion of a waterbody crossing, which

in most cases would be completed within 24 to 48 hours depending on the size of the crossing. Additionally, Algonquin proposes to cross three waterbodies using the HDD method and another two waterbodies using a horizontal bore, which would minimize impacts on open water, forested, and wetland habitats at these crossing locations (see section 4.3.2.3).

Algonquin would monitor the revegetation of the right-of-way in all areas to determine the post-construction revegetative success for two growing seasons to ensure adequate revegetation. Additional revegetation efforts would be conducted until revegetation is deemed successful. In wetland areas, Algonquin would monitor revegetation for 3 years in accordance with its E&SCP. Additionally, Algonquin has prepared an Invasive Plant Species Control Plan to prevent the introduction and proliferation of noxious and invasive plant species during and after construction (see section 4.5.4 and Appendix L).

Routine vegetative maintenance on the permanent right-of-way would be limited to no more than once every 3 years. However, a swath centered over the pipeline up to 10 feet wide would be mowed annually for maintenance and inspection purposes. To avoid impacts on ground nesting migratory birds, no maintenance clearing would be scheduled between April 15 and August 1. Vegetation growing within restored temporary work areas (i.e., on temporary extra workspaces and the temporary construction right-of-way) would be left to revegetate naturally. This natural revegetation process would gradually develop a stratified vegetative cover between the right-of-way and adjacent habitats.

In wetlands, vegetation maintenance would not be conducted across the full width of the permanent right-of-way, but instead would be limited to optional annual mowing of a 10-foot-wide strip centered over the pipeline and the cutting of trees and shrubs greater than 15 feet in height that are within 15 feet of the pipeline centerline. Trees and shrubs that become established beyond 15 feet on either side of the pipeline would not be disturbed. Vegetation maintenance practices on the right-of-way adjacent to waterbodies would consist of maintaining a riparian strip within 25 feet of the stream as measured from the mean high water mark. This riparian area would be allowed to permanently revegetate with native woody plant species across the entire right-of-way. However, similar to wetland areas, a corridor centered on the pipeline up to 10 feet wide would be maintained in an herbaceous state and trees and shrubs greater than 15 feet in height may be selectively cut within 15 feet on either side of the pipeline.

Aboveground Facilities

Construction of the Rehoboth Compressor Station would disturb about 18.1 acres of upland forest wildlife habitat. This would include approximately 8.1 acres of forest habitat at the compressor station site, an additional 4.4 acres of upland forest habitat adjacent to the compressor station site for temporary staging and extra workspace needed to construct the compressor station, 4.3 acres of forest habitat along the length of the suction and discharge lines to the existing G-5 and G-1 pipelines, and 1.3 acres of forest habitat for the compressor station access road. Following construction, 11.6 acres of the disturbed area would be retained (and maintained) for operation of the facility. The 8.1 acres of permanently maintained area at the compressor station and the 1.3 acres of permanently maintained area along the access road would be permanently converted to commercial/industrial land to operate the facility. The other 2.2 acres would be converted from forest habitat to new maintained right-of-way along the suction and discharge lines.

Construction of the remaining aboveground facilities would affect 11.1 acres of land including 4.7 acres of upland forest. Construction and operation of the aboveground facilities would permanently convert 1.5 acres of upland forest to commercial/industrial uses.

Pipe Storage and Contractor Ware Yards

Algonquin would use six pipe storage and contractor ware yards on a temporary basis to facilitate construction activities. The majority of these sites are previously disturbed and support only minimal vegetation. Early successional-upland scrub-shrub (open land) wildlife habitat is present on about 5.9 acres of the area that would be affected at the yards. The temporary use of these areas would temporarily displace the wildlife species from these scrub-shrub habitats, but it is expected the displaced wildlife would return to these areas following restoration. No permanent impacts on wildlife would result from the use of the pipe storage and contractor ware yards.

Access Roads

Impacts on wildlife habitat from the construction and operation of access roads would be similar to those resulting from pipeline construction and operation discussed above. Algonquin estimates that construction activities would affect about 5.7 acres of early successional-upland scrub-shrub (open land, residential, and agriculture) wildlife habitat and 2.8 acres of forested wildlife habitat during construction of access roads (including the Rehoboth Compressor Station access road). Of the 2.8 acres of forest land temporarily affected by construction, about 0.3 acres is wetland forest habitat. Approximately 1.4 acres of the upland scrub-shrub habitat and 0.1 acre of the wetland forest habitat would be permanently converted to commercial/industrial land. The remainder of the land that would be used for the access roads is commercial/industrial land (5.6 acres) that has little if any wildlife habitat value.

4.6.1.3 Migratory Birds

A variety of migratory bird species, including both songbirds and raptors, utilize the vegetation communities identified along the proposed pipeline routes. Migratory birds are species that nest in the United States and Canada during the summer, and then migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Of the nearly 75 migratory bird species likely to occur within the proposed Project area, 16 species are considered by the FWS to be birds of conservation concern. These include: whip-poor-will, red-headed woodpecker, American kestrel, Bewick's wren, sedge wren, wood thrush, golden-winged warbler, prairie warbler, bay-breasted warbler, cerulean warbler, worm-eating warbler, Canada warbler, Henslow's sparrow, Nelson's sharp-tailed sparrow, saltmarsh sharp-tailed sparrow, and Kentucky warbler (FWS, 2002). General impacts on birds are discussed in section 4.6.1.2.

Executive Order 13186 (January 2001) directs federal agencies to consider the effects of agency actions and plans on migratory birds, with emphasis on species of concern. Algonquin's current proposed schedule to begin clearing of the right-of-way in June of 2009 would avoid the beginning of the nesting season (April to June) for a majority of the migratory birds in the Project area, which would allow many of the species to complete their first nesting attempt before the commencement of construction. Construction activities would, however, occur during a portion of the nesting season, which could result in the mortality of eggs and young birds that have not yet fledged. The Project would also result in a temporary loss of habitat available to migratory birds. However, this effect would be mitigated by Algonquin's proposal to restore disturbed areas following construction and make them available for use by migratory birds during the next nesting season following construction. Further, by locating the proposed pipelines within or adjacent to Algonquin's and/or NSTAR's existing right-of-way, Algonquin would reduce the area of new disturbance and, therefore, would reduce impacts on habitat for migratory birds.

4.6.1.4 Sensitive or Managed Wildlife Habitats and Species

Algonquin consulted with the FWS; NOAA Fisheries; the MassNHESP; the MassDCR, ACEC Program; the MassDMF; the MassDFW; the Massachusetts Audubon Society; and the CTDEP to identify significant sensitive wildlife habitats in the Project area. This review resulted in the identification of three sensitive or managed wildlife habitats: vernal pools, the Cranberry Brook Watershed ACEC, and the Moose Hill Sanctuary/Moose Hill Farm. These habitats are described below.

Vernal Pools

Vernal pools are ephemeral wetlands that fill annually from precipitation, runoff, and rising of the water table (Kenney and Burne, 2001). In most years, vernal pools dry out completely. This wet-dry cycle precludes fish populations from becoming established, yet provides temporary habitat for a host of wildlife species (Kenney and Burne, 2001). Vernal pools are variable in appearance, water source, surrounding habitat, plant and animal content, and many other factors, but in all cases vernal pools share two characteristics: they do not hold water permanently and they are free of breeding populations of fish (Kenney and Burne, 2001).

Numerous amphibian and invertebrate species have evolved life cycles adapted to the exploitation of a temporary wetland without the predation of fish. Some vernal pool species are completely dependent (obligate vernal pool species) upon ephemeral wetlands for part of their life cycle and include species such as wood frog, spadefoot toad, four species of mole salamander, and two species of fairy shrimp (Kenney and Burne, 2001). These species are direct indicator species of vernal pools. Other species, termed facultative vernal pool species, are indirect indicators of vernal pools and other wetland habitats for their various life cycles. Facultative vernal pool species have physical or behavioral adaptations to deal with the wet-dry cycle of a vernal pool and require a pool that holds water for 2 to 3 months. Facultative vernal pool species include most frog species in Massachusetts, a few reptiles, numerous insect larvae, fingernail clams, amphibious snails, and leeches (Kenny and Burne, 2001).

Massachusetts – Within Massachusetts, vernal pools are regulated at the federal, state, and local levels. The MassNHESP "certifies" vernal pools when proper documentation demonstrates that one or more groups of species that rely on vernal pools are present. Certification of vernal pools may afford the vernal pools and the area around it (up to 100 feet beyond the vernal pool boundary) protection under a number of Massachusetts statutes and regulations, including:

- MWPA Regulations (310 CMR 10.00);
- Massachusetts Surface Water Quality Standards (314 CMR 4.00) used to administer section 401 of the federal CWA;
- Massachusetts Environmental Code: Title 5; and
- Forest Cutting Practices Act Regulations.

In Massachusetts, the COE evaluates jurisdiction of isolated potential vernal pools on a case-by-case basis and analyzes habitat values for vernal pools located in jurisdictional waters. The MassDEP defines vernal pools as "confined basin depressions, which at least in most years, hold water for a minimum of two continuous months during the spring and/or summer, and which are free of adult fish populations, as well as the areas within 100 feet of the mean annual boundaries of such depressions, to the extent that such habitat is within an Area Subject to Protection Under M.G.L. c. 131, sec. 40."

Non-certified vernal pools may also be protected under the MWPA provided that adequate scientific evidence has been presented about them during the application process. Many municipalities

have local wetland bylaw regulations that provide for additional regulations on non-certified and certified vernal pools. Algonquin has indicated that it would address vernal pool regulations at the federal, state, and local levels during permitting of the proposed E2W Project.

Algonquin conducted its initial vernal pool surveys along the Q-1 System Replacement alignment in April 2007. Algonquin evaluated wetlands within the study corridor along the I-10 Extension and at the proposed Rehoboth Compressor Station site during the summer and fall of 2007. As part of the I-10 Extension wetland survey, Algonquin identified areas that had the potential to serve as vernal pool habitat based on an evaluation of visible vernal pool indicators. During April 2008, Algonquin followed up these earlier surveys and completed a vernal pool survey of a 200-foot-wide corridor along the I-10 Extension and the Q-1 System Replacement routes. Algonquin also evaluated vernal pools along the proposed access roads.

Algonquin assigned quality values to the vernal pools. These quality values range from low to very high and are primarily based on the presence and abundance of indicator vernal pool wildlife species and secondarily the amount of surrounding habitat. Habitat was also evaluated by reviewing aerial photography. Surrounding vernal pool habitat was assessed based on a 250-foot radius from the high water mark of the vernal pool.

Algonquin's vernal pool rating mechanism included parameters from several references because there is currently no formally recognized rating system for vernal pools in New England. Each vernal pool identified during Algonquin's surveys could be "certified" with the MassNHESP. The MassNHESP certification process is essentially a recording process to document the existence of vernal pools that meet the standard criteria. All certified vernal pools, regardless of their quality/value rating, are protected by the MWPA (310 CMR 10.00). The MWPA also protects non-certified vernal pools if credible scientific evidence is presented to justify that they meet the standard criteria.

Algonquin's surveys identified a total of 18 (17 potential and 1 certified) vernal pools within 150 feet of the construction work area in Massachusetts.[4] More information about the location of these vernal pools is included in table 4.6.1-2. Table 4.6.1-3 summarizes the characteristics of these vernal pools and provides a quality rating for each pool. Based on the quality ratings provided in table 4.6.1-2, six of the vernal pools are very high or high quality vernal pools. At least a portion of four of the vernal pools, including one of the high quality vernal pools, would be crossed and directly impacted by the proposed construction right-of-way.

Three potential vernal pools were identified during the wetland delineation of the Rehoboth Compressor Station site in 2007. None of the three potential vernal pools is located within the proposed construction work area. The closest is about 75 feet from the proposed G-5 suction/discharge pipeline. The other two are approximately 400 and 700 feet away from any work areas. Algonquin's access permission was subsequently revoked so it was unable to conduct a more detailed survey of these vernal pools during the spring of 2008. However, Algonquin expects to complete the survey for vernal pools at the Rehoboth Compressor Station site in the fall of 2008 and will file the updated information when it is available.

Algonquin completed vernal pool surveys at the proposed pipe storage and contractor ware yards in April and July 2008. No vernal pools were identified at any of these facilities.

[4] Figures showing the vernal pools identified along the proposed pipeline routes can be viewed on the FERC Internet website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20080612-0109 in the "Accession Number" field. The figures are also available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions).

TABLE 4.6.1-2

Vernal Pools and Potential Vernal Pools within 150 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/Vernal Pool ID [a]	Milepost	Town(s)	Distance from the Pipeline	Wetland Association
Massachusetts				
I-10 Extension				
B-VP-3	4.6	Braintree	Outside of the proposed construction right-of-way and about 30 feet from the pipeline centerline.	Wetland I10 W50C
CVP B-VP-4 [b]	6.5	Holbrook	Within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland I10 W26
B-VP-5	7.2	Holbrook	Outside of the proposed construction right-of-way and about 70 feet from the pipeline centerline.	Wetland I10 W31
B-VP-8	10.1	Stoughton	Outside of the proposed construction right-of-way and about 80 feet from the pipeline centerline.	Wetland I10 W38C
B-VP-10	10.8	Stoughton	Partially within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland I10 WCC2
B-VP-11	10.9	Stoughton	Outside of the proposed construction right-of-way and about 25 feet from the pipeline centerline.	Wetland I10 WCC3
B-VP-13	11.1	Stoughton	Outside of the proposed construction right-of-way and about 45 feet from the pipeline centerline.	Wetland I10 WCC10
B-VP-14	11.2	Stoughton	Outside of the proposed construction right-of-way and about 65 feet from the pipeline centerline.	Wetland I10 WCC9
B-VP-15	11.4	Stoughton	Outside of the proposed construction right-of-way and about 65 feet from the pipeline centerline.	Wetland I10 WCC7
B-VP-9	11.6	Stoughton	Outside of the proposed construction right-of-way and about 115 feet from the pipeline centerline.	Wetland I10 DEP 11
B-VP-16	12.2	Canton	Outside of the proposed construction right-of-way and about 55 feet from the pipeline centerline.	N/A
A-VP-15	12.5	Canton	Outside of the proposed construction right-of-way and about 60 feet from the pipeline centerline.	Wetland I10 WCC13
Q-1 System Replacement				
A-VP-4	14.5	Sharon	Partially within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland QB-9
A-VP-7	15.7	Canton	Adjacent to access road 15.62; outside of the proposed construction right-of-way and about 130 feet from the pipeline centerline.	Wetland QB-12
A-VP-8	15.7	Canton	Outside of the proposed pipeline right-of-way and about 55 feet from the pipeline centerline.	Wetland QB-12
A-VP-9	16.0	Canton	Within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland QB-12
A-VP-14	19.2	Canton	Outside of the proposed construction right-of-way and about 45 feet from the pipeline centerline.	Wetland QB-29
Rehoboth Compressor Station				
PVP-R2	N/A	Rehoboth	Outside of the proposed construction work area and approximately 75 feet north of the proposed G-5 suction/discharge line location.	Wetland R15
Connecticut				
E-3 System Replacement				
E3-VP-1	1.4	Norwich	Outside of the proposed construction right-of-way and about 40 feet from the pipeline centerline.	Wetland E3-W10
E3-VP-2	1.4	Norwich	Partially within the proposed construction right-of-way and about 30 feet from the pipeline centerline.	Wetland E3-W9
E3-VP-3	4.4	Preston	Partially within the proposed construction right-of-way and about 15 feet from the pipeline centerline.	Wetland E3-W20
E3-VP-4	7.1	Preston	Within the proposed construction right-of-way and about 15 feet from the pipeline centerline.	Wetland E3-W29

TABLE 4.6.1-2 (cont'd)

Vernal Pools and Potential Vernal Pools within 150 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/Vernal Pool ID [a]	Milepost	Town(s)	Distance from the Pipeline	Wetland Association
E3-VP-5	7.4	Preston	Within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland E3-W28
E3-VP-6	8.2	Preston	Outside of the proposed construction right-of-way and about 75 feet from the pipeline centerline.	Wetland E3-W34
E3-VP-7	9.4	Preston	Outside of the proposed construction right-of-way and about 65 feet from the pipeline centerline.	Wetland E3-W39
E3-VP-8	9.8	Ledyard	Partially within the proposed construction right-of-way and about 15 feet from the pipeline centerline.	Wetland E3-W40
E3-VP-9	10.0	Preston	Partially within the proposed construction right-of-way and crossed by the pipeline centerline.	Wetland E3-W41

[a] Our review of the MassGIS database identified eight other mapped vernal pools, including one certified vernal pool, close to the proposed construction work area. Algonquin's surveys for vernal pools verified that none of these vernal pools existed or are within 150 feet of the proposed construction work area.

[b] Certified Vernal Pool.

N/A = Not applicable.

TABLE 4.6.1-3

Vernal Pool Characteristics for Vernal Pools Located Within 150 feet of the Construction Work Area for the HubLine/East to West Project

Vernal Pool	Milepost	Town(s)	Hydrology Observations During Vernal Pool Surveys (Date)	Hydrology Observations During Wetland Surveys (Date)	Wildlife Species [a]	Dominant Vegetation Within Vernal Pool			Percent Forested (within 250 feet)	Quality Rating [b]
						Tree	Shrub	Herb		
Massachusetts										
I-10 Extension										
B-VP-3	4.6	Braintree	Seasonally flooded (4/15/2008)	Saturated (10/31/2008)	WF	Red maple, swamp white oak	Highbush blueberry	N/A	50-75	Low
CVP B-VP-4	6.5	Holbrook	Seasonally flooded (4/15/2008)	Saturated (8/6/2007)	SS WF	Red maple	Highbush blueberry, sweet pepperbush	Sphagnum moss	50-75	Low
B-VP-5	7.2	Holbrook	Seasonally flooded (4/15/2008)	Saturated (8/7/2007)	SS WF	Red maple	Sweet pepperbush, red-osier dogwood	Common reed	50-75	High
B-VP-8	10.1	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded (3/14/2008)	SS WF	Swamp white oak, red maple	Sweet pepperbush, red maple, common buttonbush	Purple loosestrife, grass spp.	25-50	High
B-VP-10	10.8	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded (11/30/2007)	SS	Red maple	Sweet pepperbush, common greenbrier	N/A	50-75	Moderate
B-VP-11	10.9	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded (11/30/2007)	SS WF	Red maple	Highbush blueberry, sweet pepperbush, common buttonbush	N/A	75-100	Moderate [c]
B-VP-13	11.1	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded/saturated (12/11/2007)	WF	Swamp white oak, red maple	Highbush blueberry	N/A	75-100	Low
B-VP-14	11.2	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded/saturated (12/11/2007)	WF SS	Red maple	Highbush blueberry	Sphagnum moss	75-100	High
B-VP-15	11.4	Stoughton	Seasonally flooded (4/28/2008)	Seasonally flooded/saturated (12/11/2007)	WF	Red maple	Highbush blueberry, sweet pepperbush	Marsh fern, sphagnum moss	75-100	Moderate [c]

TABLE 4.6.1-3 (cont'd)

Vernal Pool Characteristics for Vernal Pools Located Within 150 feet of the Construction Work Area for the HubLine/East to West Project

Vernal Pool	Milepost	Town(s)	Hydrology Observations During Vernal Pool Surveys (Date)	Hydrology Observations During Wetland Surveys (Date)	Wildlife Species [a]	Dominant Vegetation Within Vernal Pool			Percent Forested (within 250 feet)	Quality Rating [b]
						Tree	Shrub	Herb		
B-VP-9	11.6	Stoughton	Seasonally flooded (4/17/2008)	Seasonally flooded/saturated (8/6/2008)	SS	Red maple	Highbush blueberry, sweet pepperbush, fetterbush	Sphagnum moss	75-100	Low
B-VP-16	12.2	Canton	Seasonally flooded (4/28/2008)	Not visited	SS	N/A	Highbush blueberry, sweet pepperbush	Sensitive fern	75-100	High
A-VP-15	12.5	Canton	Seasonally flooded (4/17/2008)	Saturated (12/11/2007)	WF SS FS	Swamp white oak	Common greenbrier	N/A	75-100	Very High
Q-1 System Replacement										
A-VP-4	14.5	Sharon	Seasonally flooded (4/15/2008)	Saturated (7/10/2007)	SS WF	N/A	N/A	Cattail, soft rush, steeple bush, tussock sedge, sphagnum moss	50-75	High
A-VP-7	15.7	Canton	Seasonally flooded (4/15/2008)	Seasonally flooded/Saturated (7/11/2007)	SS	Red maple	Willow spp., highbush blueberry	Tussock sedge, skunk cabbage, purple loosestrife	50-75	Low
A-VP-8	15.7	Canton	Seasonally flooded (4/15/2008)	Seasonally flooded/Saturated (7/11/2007)	WF	N/A	Highbush blueberry, sweet pepperbush	Tussock sedge, skunk cabbage	50-75	Moderate
A-VP-9	16.0	Canton	Seasonally flooded (4/15/2008)	Seasonally flooded/Saturated (7/11/2007)	SS	Red maple, swamp tupelo	Highbush blueberry	N/A	50-75	Moderate
A-VP-14	19.2	Canton	Seasonally flooded (4/17/2008)	Seasonally flooded/Saturated (7/11/2007)	WF	N/A	N/A	Common reed	0-25	Low

TABLE 4.6.1-3 (cont'd)

Vernal Pool Characteristics for Vernal Pools Located Within 150 feet of the Construction Work Area for the HubLine/East to West Project

Vernal Pool	Milepost	Town(s)	Hydrology Observations During Vernal Pool Surveys (Date)	Hydrology Observations During Wetland Surveys (Date)	Wildlife Species [a]	Dominant Vegetation Within Vernal Pool			Percent Forested (within 250 feet)	Quality Rating [b]
						Tree	Shrub	Herb		
Rehoboth Compressor Station [d]										
PVP-R2	N/A	Rehoboth	N/A	Seasonally flooded/Saturated (8/14/2007)	N/A	Swamp white oak, white pine	Highbush blueberry, sweet pepperbush	Sphagnum moss, highbush blueberry, sweet pepperbush	75-100	N/A
Connecticut										
E-3 System Replacement										
E-3-VP-1	1.4	Norwich	Seasonally flooded (4/15/2008)	Seasonally flooded (6/19/2007)	WF SS	Red maple, white oak, white pine, black birch	Northern spicebush	N/A	75-100	Moderate
E-3-VP-2	1.4	Norwich	Seasonally flooded (4/15/2008)	Seasonally flooded (6/19/2007)	WF	Red maple, black birch, white pine, American beech	American beech	N/A	75-100	Low
E-3-VP-3	4.4	Preston	Seasonally flooded (4/15/2008)	Seasonally flooded (6/21/2007)	WF SS	N/A	Northern spicebush, highbush blueberry, American elderberry	N/A	50-75	Very High
E-3-VP-4	7.1	Preston	Seasonally flooded (4/15/2008)	Permanently/ Seasonally flooded (6/22/2007)	WF	N/A	American hornbeam	Sensitive fern, common reed	75-100	Moderate
E-3-VP-5	7.4	Preston	Seasonally flooded (4/15/2008)	Seasonally flooded (6/22/2007)	WF SS	N/A	White ash	Sedge spp., sensitive fern	50-75	High
E-3-VP-6	8.2	Preston	Seasonally flooded (4/15/2008)	Saturated (6/22/2007)	WF	Red maple	Red maple, Northern spicebush	Sedge spp., wool grass	75-100	High

TABLE 4.6.1-3 (cont'd)

Vernal Pool Characteristics for Vernal Pools Located Within 150 feet of the Construction Work Area for the HubLine/East to West Project

Vernal Pool	Milepost	Town(s)	Hydrology Observations During Vernal Pool Surveys (Date)	Hydrology Observations During Wetland Surveys (Date)	Wildlife Species [a]	Dominant Vegetation Within Vernal Pool			Percent Forested (within 250 feet)	Quality Rating [b]
						Tree	Shrub	Herb		
E-3-VP-7	9.4	Preston	Seasonally flooded (4/15/2008)	Seasonally flooded/saturated (6/22/2007)	WF SS FS	Red maple, northern red oak	Northern spicebush	N/A	75-100	Very High
E-3-VP-8	9.8	Ledyard	Seasonally flooded (4/15/2008)	Seasonally flooded (6/22/2007)	SS FS	Red maple	Winterberry, cat greenbrier, witch hazel	N/A	75-100	Very High
E-3-VP-9	10.0	Ledyard	Seasonally flooded (4/15/2008)	Seasonally flooded (6/22/2007)	SS	Red maple	N/A	N/A	75-100	Moderate

[a] Wildlife species: WF = Wood Frog; SS = Spotted Salamander; FS = Fairy Shrimp.

[b] Vernal Pool Quality Rating Thresholds. The numerical values provided in the thresholds below refer to the number of egg masses recorded during the survey effort per species:
Very High: >50 WF and/or >20 SS, and/or FS, 75-100 percent forested
High: >50 WF and/or >20 SS, and/or FS, 0-50 percent forested; or 25-50 WF and/or 10-20 SS, 50-75 percent forested
Moderate: 25-50 WF and/or 10-20 SS, 0-25 percent forested; or 10-25 WF and/or 5-10 SS, 25-50 percent forested
Low: 1-9 WF and/or 1-4 SS, 0-25 percent forested.

[c] Only a portion of the vernal pool survey was limited to the pipeline study area and portions of these vernal pools were not surveyed. As a result, the portions of these vernal pools surveyed have been conservatively ranked at one level higher due to the lack of survey area.

[d] Vernal pool surveys were not conducted at the Rehoboth Compressor Station. There would be no impact on vernal pools or associated wetlands.

N/A = Not applicable.

Connecticut – Within Connecticut, vernal pools are regulated at the federal, state, and in some cases, local levels. Because no certification program exists for vernal pools in Connecticut, the COE determines on a case-by-case basis which vernal pools fall within its jurisdiction. At the state level, vernal pools are subject to the jurisdiction of the CTDEP under the Connecticut Water Quality Standards pursuant to section 22a-426 of the CGS (CT-WQS 12-17-02). Local wetland agencies may have regulations that provide additional protection to vernal pools. Algonquin has indicated that it would address vernal pool regulations at the federal, state, and local levels during permitting of the proposed E2W Project.

Vernal pools and potential vernal pools were identified during field surveys along the E-3 System Replacement route (including associated temporary extra workspaces and access roads) during the spring and summer of 2007 using the same methods as described for Massachusetts. Additional surveys were completed during April 2008 to confirm the known vernal pools and to evaluate the potential vernal pools identified during 2007. Table 4.6.1-2 summarizes the vernal pools within 150 feet of the E-3 System Replacement.

Algonquin's surveys identified nine vernal pools within 150 feet of the construction work area in Connecticut. More information about the location of these vernal pools is included in table 4.6.1-2. Table 4.6.1-3 summarizes the characteristics of these vernal pools and provides a quality rating for each pool. Based on the quality ratings provided in table 4.6.1-3, five of these are very high or high quality vernal pools. At least a portion of six of these vernal pools, including three of the high or very high quality vernal pools, would be crossed and directly impacted by the proposed construction right-of-way.

Algonquin completed vernal pool surveys at the only proposed pipe storage and contractor ware yard (Preston Yard) in Connecticut in April 2008. No vernal pools were identified at this facility.

Cranberry Brook Watershed ACEC

The Cranberry Brook Watershed ACEC is located in Holbrook and Braintree, Massachusetts and hosts a variety of wildlife habitat types including forested uplands and wooded swamps, marshes, ponds, streams, and two quaking sphagnum bogs. The Cranberry Brook Watershed ACEC is also mapped by the state as Estimated and Priority Habitat for rare species (see section 4.7.3). The I-10 Extension would cross about 1.3 miles of the ACEC between approximate MPs 5.0 and 6.3. Between these mileposts, the pipeline would be mostly parallel to and within the existing NSTAR right-of-way and would cross six wetlands and one waterbody (unnamed tributary to Cranberry Pond).

Moose Hill Wildlife Sanctuary and Moose Hill Farm

The Moose Hill Wildlife Sanctuary is an approximately 2,000-acre wildlife sanctuary in Sharon, Massachusetts that is owned and managed by the Massachusetts Audubon Society. The sanctuary is divided by the NSTAR powerline right-of-way corridor and Algonquin's existing Q-1 system pipeline. The Q-1 System Replacement pipeline would cross this sanctuary between approximate MPs 12.2 and 12.4 and MPs 13.7 and 14.4. Between these mileposts, the Q-1 System Replacement pipeline would either be adjacent to the south side of Interstate 95 (MPs 12.2 to 12.4) or adjacent to NSTAR's existing powerline right-of-way. In these areas, the pipeline would cross two wetlands and two waterbodies (Traphole Brook and an unnamed intermittent stream). One additional wetland would be permanently impacted by the proposed permanent access road located near MP 12.2.

The Moose Hill Farm is a 347-acre property that is owned by The Trustees of Reservations and abuts the Moose Hill Wildlife Sanctuary. The Trustees of Reservations is a private land trust that preserves properties of exceptional scenic, historic, and ecological value in Massachusetts for public use

and enjoyment (The Trustees of the Reservation, 2007). The Q-1 System Replacement pipeline would cross the Moose Hill Farm between approximate MPs 12.4 and 13.7. Between these mileposts, the pipeline would be adjacent to NSTAR's existing right-of-way and would cross four wetlands. No waterbodies would be crossed.

The Moose Hill Wildlife Sanctuary and Moose Hill Farm support a diverse assemblage of plant communities and habitat types including large wetland systems, forest lands, and early successional plant communities such as scrub-shrub, open grasslands, and rock outcrop areas. With this diversity of habitats comes a diversity of wildlife species. Species that could be found in the area include white-tailed deer, coyote, wild turkey, forest-interior and open land birds, and wildlife species dependent on aquatic habitats such as muskrats, mink, and a variety of amphibians and reptiles. Both areas have functioning vernal pools, and support rare plants and wildlife. These significant habitats are also mapped by the state as Estimated and Priority Habitats for rare species (see section 4.7.3).

Significant Sensitive Wildlife Habitat Impacts and Mitigation

Pipeline construction within vernal pools would have a number of potential impacts including alteration of a pool's capacity for holding water; direct disturbance to amphibian adults, eggs, and larvae; and removal of vegetation that could serve as egg attachment sites and cover. Removal of the forest canopy within or around a pool could lead to an increase in water temperature and rates of evapotranspiration. Local populations of forest-dwelling amphibians could be impacted by the permanent conversion of forested upland habitat adjacent to the pool to an herbaceous or shrub habitat type. Specific impacts would include the loss of shade and moisture, loose forest litter material, and coarse woody debris.

After Algonquin's application was filed, it adopted several route variations to avoid or minimize impacts on vernal pools (see section 3.5). Based on our review of Algonquin's current alignment sheets, we believe that Algonquin could further modify its route to avoid or reduce impacts on vernal pools. Specifically, it appears that Algonquin could avoid impacts on vernal pools at MPs 1.4, 4.4, and 9.8 of the E-3 System Replacement and reduce impacts on vernal pools at MP 10.8 of the I-10 Extension, MPs 14.5 and 16.0 of the Q-1 System Replacement, and MP 10.0 of the E-3 System Replacement by reducing the construction right-of-way width at these locations. Therefore, **we recommend that**:

- **Algonquin should assess the potential to reduce the construction right-of-way width at MPs 10.8 of the I-10 Extension; MPs 14.5 and 16.0 of the Q-1 System Replacement; and MPs 1.4, 4.4, 9.8, and 10.0 of the E-3 System Replacement to avoid or reduce impacts on vernal pools at these locations. Algonquin should file revised alignment sheets that depict the reduced construction right-of-way width for all locations where Algonquin determines that a reduction is feasible. If Algonquin determines that reducing the construction right-of-way width is not feasible at any of these locations, it should provide a site-specific explanation of the conditions that would not permit a workspace reduction. Algonquin should file its assessment and the applicable revised alignment sheets with the Secretary <u>during the draft EIS comment period</u>.**

Algonquin would employ measures outlined in its E&SCP to further minimize or avoid impacts on vernal pools. Construction of the pipelines through vernal pools would be conducted in the same manner as through other wetlands, and revegtation and restoration efforts would be similar.

Algonquin met with the MassNHESP on September 12, 2008 to discuss survey results for the blue-spotted salamander, and specifically the certified vernal pool located at MP 6.5 of the I-10 Extension

(CVP B-VP-4). The MassNHESP's records show this vernal pool to be breeding habitat for the salamander. During this meeting, the MassNHESP expressed concern over the potential impact on this vernal pool even though no salamanders were observed during Algonquin's spring 2008 vernal pool surveys. To address these concerns, Algonquin met with MassNHESP staff in the field to evaluate the habitat and to discuss construction and possible avoidance, minimization, and mitigation measures.

Initially, the MassNHESP requested that Algonquin evaluate the feasibility of using the bore method to install the pipe under this vernal pool, thereby avoiding direct impacts. However, use of the bore method would require increased temporary extra workspace to accommodate the bore pit and provide an equipment travel lane. This increased temporary extra workspace would increase impacts on the terrestrial forested habitat. According to Algonquin, adopting the bore method would not be consistent with the MassNHESP's overall goal of minimizing impacts on forested wetlands and uplands within 300 feet of vernal pools. In addition, Algonquin determined that there are large surface boulders in this area that could increase the risk of failure of the bore and believes that use of the bore method would increase the impacts of construction on nearby residences. For these reasons, Algonquin determined that the bore method is not a feasible option for installing the pipeline across this vernal pool.

Alternatively, Algonquin proposes to install the pipeline between approximate MPs 6.5 and 6.6 using the stove-pipe construction method to minimize workspace and associated impacts on this vernal pool and adjacent habitat. The stove-pipe construction method is described in section 2.3.2. Use of the stove-pipe method would allow Algonquin to eliminate approximately 35 feet of the construction right-of-way, which would result in only a 50-foot-wide construction right-of-way. This conservation measure would result in an overall decrease of approximately 0.4 acre of disturbance to this vernal pool and adjacent upland habitat, including approximately 0.2 acre of forested impact. We concur with Algonquin's evaluation that the use of the stove-pipe method to install the pipeline across this vernal pool would minimize impacts on this resource to a greater degree than use of the bore method.

In addition to the use of the stove-pipe method, Algonquin developed other conservation measures through its consultations with the MassNHESP. These additional conservation measures are discussed in section 4.7.3.

Based on its past experience constructing pipelines within and near vernal pools, Algonquin states that its implementation of proper construction techniques, erosion and sediment control measures, and restoration procedures would maintain the physical and hydrological integrity of the affected vernal pools, and that once the pools are restored and revegetated, vernal pool species such as mole salamanders and wood frogs would return and use these resource areas for breeding. Algonquin has also indicated that it would continue its consultations with the MassNHESP and CTDEP regarding construction through and near vernal pools and would develop and implement additional measures as necessary to minimize or mitigate impacts on these areas. Algonquin's final conservation measures would be included in its Massachusetts Endangered Species Act (MESA) application that would be submitted to the MassNHESP in late October 2008. Algonquin submitted its state 401 Water Quality Certification applications to the MassDEP on July 2, 2008 and to the CTDEP on June 27, 2008; its application for a section 404/10 Individual Permit was submitted to the COE on June 16, 2008. To ensure that issues related to vernal pools are appropriately addressed by Algonquin during the federal and state review processes, **we recommend that:**

- **Algonquin should continue to consult with the COE, the MassNHESP, the MassDEP, and the CTDEP to determine additional recommended mitigation measures to minimize impacts on vernal pools. Algonquin should file a description of the agency recommendations and specifically identify the additional mitigation measures it would implement with the Secretary <u>during the draft EIS comment period</u>.**

Approximately 6,864 linear feet of upland and wetland habitat within the Cranberry Brook Watershed ACEC would be crossed by the I-10 Extension. Most of the area that would be crossed is forest land and some tree clearing would be necessary. However, Algonquin has collocated all but a short segment of the pipeline route adjacent to the existing NSTAR right-of-way and has overlapped the proposed construction work area with the existing cleared right-of-way to the maximum extent practicable.

Algonquin held an interagency meeting and site visit at the Cranberry Brook Watershed ACEC on March 7, 2008 with representatives from the FERC; the MassDCR, ACEC Program; the MassDEP; the Towns of Braintree and Holbrook; and the EPA to review the pipeline alignment and potential alternatives. Based on input received from stakeholders and further evaluation of the route alignment, Algonquin evaluated three alternatives that would either avoid or significantly reduce the crossing of the ACEC (see section 3.4.1). Although Algonquin ultimately rejected these alternatives, it identified and adopted two minor route variations through the ACEC during the Pre-Filing Process that would reduce impacts on natural resources (see section 3.5). The first minor route adjustment, between MPs 5.6 and 5.8, shifted the pipeline alignment to the opposite side of the NSTAR right-of-way to avoid impacts on a stand of Atlantic white cedar trees associated with the wetland that surrounds Cranberry Pond. The second minor route adjustment, between MPs 5.8 and 6.1, reduced wetland impact and tree clearing by maximizing Algonquin's use of the existing cleared NSTAR right-of-way.

Construction of the pipeline would have some temporary, short-term impacts on wildlife species and habitat associated with the removal of existing vegetation and would result in the conversion of some forest land habitat to scrub-shrub habitat. However, significant long-term habitat changes are not anticipated. Algonquin would implement its E&SCP to minimize impacts on this sensitive wildlife habitat. Following construction, the right-of-way would be restored and seeded. As discussed in section 4.5.3, Algonquin is in the process of consulting with the MassNHESP and the MassDCR and is conducting research to identify an appropriate and available native seed mix to be used in the Cranberry Brook Watershed ACEC. After the right-of-way revegetates, some of it would continue to provide the same wildlife habitat functions and values as currently exist. Algonquin would also implement its Invasive Plant Species Control Plan (see Appendix L) through this area to minimize the spread of invasive species to wetland areas. Algonquin would continue its consultations with the MassDCR, ACEC Program to discuss construction impacts and mitigation within the Cranberry Brook Watershed ACEC and would file any additional agency-recommended measures.

Approximately 5,000 linear feet of the Moose Hill Wildlife Sanctuary and 4,901 linear feet of the Moose Hill Farm would be crossed by the Q-1 System Replacement. The proposed construction work area consists of Algonquin's existing pipeline right-of-way and workspace on NSTAR's existing right-of-way to the north. The vegetation on these rights-of-way primarily consists of scrub-shrub and open field habitats. There would be some temporary, short-term impacts on wildlife species and habitat during construction associated with the removal of this vegetation. However, significant long-term habitat changes are not anticipated. Algonquin would implement its E&SCP to minimize impacts on the area. Following construction, the right-of-way would be restored and seeded. After the right-of-way revegetates, it would continue to provide the same wildlife habitat functions and values as currently exist. The only permanent impact would be on a small corner area close to Interstate 95 that would be converted along with a larger piece of land outside of the sanctuary to commercial/industrial property for the new OPP regulator station. Algonquin would continue its consultations with the Massachusetts Audubon Society and The Trustees of Reservations regarding site-specific measures to minimize and mitigate impacts on the Moose Hill Wildlife Sanctuary and Moose Hill Farm and would file any additional agency-recommended measures.

4.6.2 Aquatic Resources

4.6.2.1 Existing Aquatic Resources

Algonquin consulted with the FWS, NOAA Fisheries, the MassDFW, the MassDMF, and the CTIFD to identify fishery resources in the proposed Project area. Section 4.3.2 provides a characterization of the waterbodies that would be crossed by the proposed E2W Project.

Pipeline Facilities

As described in section 4.3.2, the proposed pipelines would require a total of 39 waterbody crossings. Table 4.3.2-1 lists the name, location, crossing width, flow and fishery type, FERC classification, state water quality classification, and proposed crossing method for these waterbodies. The crossing methods are described in detail in section 2.3.2. A total of 23 of the proposed waterbody crossings would be along the I-10 Extension and Q-1 System Replacement in Massachusetts (14 along the I-10 Extension and 9 along the Q-1 System Replacement) and 16 waterbodies would be crossed by the E-3 System Replacement in Connecticut.

Massachusetts – Classification of fisheries habitat within the proposed E2W Project area includes consideration of both chemical and biological characteristics. Physical and chemical properties used to determine fishery classification include water temperature, salinity, and whether the waterbody is part of a marine, estuarine, or freshwater system. Habitat classification also depends on the presence of certain fish species in the aquatic community that could use the habitat for reproduction.

Under Massachusetts State Water Quality Standards (314 CMR 4.00), certain waterbodies have been designated as having the ability to support either coldwater or warmwater fishery habitat based primarily on temperature regimes and identified water quality impairments if applicable. Coldwater fisheries habitat is typically characterized both by lower average water temperatures and by the ability to support breeding fish such as brook trout. Under these standards, coldwater fishery habitats are defined as waters in which the mean of the maximum daily temperature over a 7-day period generally does not exceed 68 degrees Fahrenheit (°F) (20 degrees Celsius (°C)) and, when other ecological factors are favorable (such as habitat), are capable of supporting a year-round population of coldwater stenothermal aquatic life such as trout.

Warmwater fisheries, while having a higher average temperature, are not able to support breeding for coldwater species and are characterized by fish such as largemouth bass, smallmouth bass, bluegill, pumpkinseed, yellow perch, black crappie, redbreast sunfish, green sunfish, chain pickerel, and common carp. Under these standards, warmwater fishery habitats are defined as waters in which the maximum mean monthly temperature generally exceeds 68° F (20° C) during the summer months and are not capable of sustaining year-round populations of coldwater stenothermal aquatic life.

Fisheries may also be classified based on whether they support anadromous fish, which are marine-living fish that travel upstream to spawn in freshwater, or catadromous fish, which are freshwater-living fish that travel downstream to breed in saltwater. These fish species are collectively known as diadromous. Diadromous fisheries in the Project area comprise seven species: blueback herring, Atlantic tomcod, Alewife, rainbow smelt, striped bass, fourspine stickleback (anadromous), and American eel (catadromous).

Information on fishery resources along the I-10 Extension and the Q-1 System Replacement was provided by the NOAA Fisheries, MassDFW, and the MassDMF. Additionally, Algonquin obtained fishery information for 13 waterbodies for which insufficient or no data were available from the agencies by conducted electrofishing surveys according to procedural recommendations from the MassDFW. Algonquin's consultations and field work indicate that the fishery resources along the I-10 Extension and

Q-1 System Replacement consist primarily of warmwater fisheries. The only coldwater fishery that would be crossed in Massachusetts is Traphole Brook. The only marine fishery that would be crossed in Massachusetts is the Weymouth Fore River, which also supports diadromous fish runs and EFH. Fish species known to occur in the Project area in Massachusetts are summarized in table 4.6.2-1.

Connecticut – In Connecticut, there are 26 naturally occurring freshwater fish species (CTDEP, 2005). In addition to the known naturally occurring species, more than 50 non-native fish species have been released into Connecticut waters or imported into the state (CTDEP, 2005). Fishery resources along the E-3 System Replacement route consist of coldwater, warmwater, and diadromous fisheries. All of the fisheries that would be affected in Connecticut are freshwater fisheries. The Shetucket River (crossed by the E-3 System Replacement) is tidal, but the proposed crossing location is upstream of the estuary, which is considered by Connecticut Water Quality Standards to end at the Greenville Dam. Fish species known to occur in the Project area in Connecticut are summarized in table 4.6.2-1.

The majority of the waterbodies located along the E-3 System Replacement support warmwater fisheries. Two waterbodies (Norwichtown Brook and Hunter Brook, which is crossed twice) support coldwater fisheries. Hunter Brook also supports diadromous fish runs, as does Main Brook and the Shetucket River.

Aboveground Facilities

No waterbodies would be affected by construction and operation of the Rehoboth Compressor Station or other aboveground facilities. Therefore, Project activities at the Rehoboth Compressor Station or other aboveground facilities would not affect aquatic resources.

Pipe Storage and Contractor Ware Yards

No waterbodies would be affected by the use of pipe storage and contractor ware yards. Therefore, Project activities at the proposed pipe storage and contractor ware yards would not affect aquatic resources.

Access Roads

Access road TAR 16.05 would cross Massapoag Brook in Massachusetts. Access road TAR 16.05 is an existing dirt/fill access road that is used to provide access to the NSTAR powerline right-of-way and would be used to construct the Q-1 System Replacement. Massapoag Brook, which is a warmwater stream, crosses under this access road through a culvert. Minor maintenance/grading of this road may be required during construction to allow for safe passage of equipment. Timber matting may also be used to provide additional support for heavy equipment over the culvert.

4.6.2.2 General Impacts and Mitigation

In-stream construction across waterbodies could have both direct and indirect effects on aquatic resources. The degree of impact would depend on the proposed crossing method, the existing conditions at each crossing location, the mitigation measures employed, and the timing of construction.

Construction impacts on fishery resources may include direct contact by construction equipment with food resources in the form of relatively immobile prey, increased sedimentation and water turbidity immediately downstream of the construction work area, alteration or removal of aquatic habitat cover, introduction of pollutants, impingement or entrainment of fish and other biota associated with the use of water pumps at dam and pump crossings, and downstream scour associated with the use of those pumps.

TABLE 4.6.2-1

Fish Species Known to Occur in Waterbodies Crossed by the HubLine/East to West Project

Common Name	Binomial Nomenclature
Warmwater Fisheries (Freshwater)	
Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Brown bullhead	*Ameiurus nebulosus*
Chain pickerel	*Esox niger*
Common carp	*Cyprinus carpio*
Golden shiner	*Notemigonus crysoleucas*
Common shiner	*Notropis cornutus*
Largemouth bass	*Micropterus salmoides*
Pumpkinseed	*Lepomis gibbosus*
Redbreast sunfish	*Lepomis auritus*
Redfin pickerel	*Esox americanus americanus*
Smallmouth bass	*Micropterus dolomieu*
Swamp darter	*Etheostoma fusiforme*
Yellow bullhead	*Ameirus natalis*
Creek chubsucker	*Erimyzon oblongus*
Yellow perch	*Perca flavescens*
White perch	*Morone Americana*
White catfish	*Ameiurus catus*
Northern pike	*Esox lucius*
Tiger Muskellunge	*Esox masquinongy*
Banded sunfish	*Enneacabthus obesus*
Banded killifish	*Fundulus diaphanous*
Rockbass	*Ambloplites rupestris*
Green sunfish	*Lepomis cyanellus*
Tessellated darter	*Etheostoma olmstedi*
Spottail shiner	*Notropis hudsonius*
Fallfish	*Semotilus corporalis*
Coldwater Fisheries (Freshwater)	
Blacknose dace	*Rhihichthys atratulus*
Longnose dace	*Rhihichthys cataractae*
White sucker	*Catostomus commersoni*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Rainbow trout	*Oncorhynchus mykis*
Marine Fisheries	
See section 4.6.2.4	
Diadromous Fisheries	
Anadromous	
Blueback herring	*Alosa aestivalis*
Atlantic tomcod	*Microgadus tomcod*
Alewife	*Alosa pseudoharengus*
Rainbow smelt	*Osmerus mordax*
Striped bass	*Morone saxatalis*
Fourspine stickleback	*Apeltes quadracus*
Atlantic salmon	*Salmo salar*
Catadromous	
American eel	*Anguilla rostrata*

In-stream construction, whether by dry waterbody crossing methods or the wet open-cut method, could interfere with essential life processes. Short-term, physical habitat disruption would occur during trenching activities. Equipment moving through a stream and the trenching of a waterbody could also physically damage fish, fish eggs, and other aquatic organisms, including fish prey and forage species. In-stream structures for support of equipment bridges over streams may similarly impact fish and other aquatic organisms. Construction could also delay migrating fish from reaching upstream spawning areas or delay downstream movement of juveniles. Fish passage during dam and pump crossings would be temporarily restricted during the 24 to 48 hours it would typically take to complete the removal of the existing pipeline (for the Q-1 and E-3 System Replacements) and installation of the new pipeline.

Aquatic resources could also be affected by the removal of vegetation and habitat on and adjacent to the banks of the waterbody. The clearing and grading of vegetation during construction could increase erosion along streambanks and turbidity levels in the waterbodies. Alteration of the natural drainage ways or compaction of soils by heavy equipment near streambanks during construction may accelerate erosion of the banks, runoff, and the transportation of sediments into waterbodies. The degree of impact on aquatic organisms due to erosion would depend on sediment loads, stream velocity, turbulence, streambank composition, and sediment particle size.

The wet open-cut method would have the most potential to cause elevated levels of sediment to enter a waterbody. Increased levels of sedimentation could adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, and spawning habitat. Increased sedimentation within waterbodies could also temporarily impact diadromous fish passage by delaying or preventing migrating fish from reaching upstream spawning areas. Suspended particles and sediment can result in turbidity in sufficient quantities to affect oxygen exchange over the gills in aquatic species, resulting in weakened individuals or mortality. Additionally, sediment stirred into the water column can be redeposited on downstream substrates, which could bury aquatic macroinvertebrates (an important food source for salmonids).

Long-term degradation of habitats could occur if the stream contours are permanently modified in the area of the crossing or the flow patterns are changed. Loss of riparian vegetation along the banks would reduce shade, potentially increasing water temperatures, diminish escape cover, and remove an important source of terrestrial food for aquatic organisms. Elevated water temperatures could, in turn, lead to reductions in levels of dissolved oxygen, which can negatively influence habitat quality and the fish populations that occupy these habitats.

Algonquin does not anticipate the need for extensive blasting at waterbodies along the Q-1 System Replacement in Massachusetts and the E-3 System Replacement in Connecticut, because these pipelines would be located within existing trenches. However, some limited blasting may be required to increase the depth and width of the existing trenches to accommodate the larger diameter pipeline. Along the proposed I-10 Extension, Algonquin anticipates that some streambeds would contain shallow bedrock that may need to be drilled and blasted to install the pipeline. Blasting activities are discussed in sections 2.3.2 and 4.1.3.5. The potential adverse effects of blasting may include direct mortality of organisms in the immediate vicinity of the blast. Blasting could also have the same short-term adverse impacts as trenching, including reduced macroinvertebrate prey base, alteration of substrate characteristics, and loss of large woody debris and structure.

Water appropriations for hydrostatic testing, mixing of drilling mud, and dust suppression could entrain or impinge eggs and juvenile fish, or their prey. Discharges of hydrostatic test water, if uncontrolled, could scour the streambed and increase the potential for erosion and sedimentation.

Accidental spills of construction-related fluids (e.g., oil, gasoline, or hydraulic fluids) on the landscape or directly into waterbodies could affect aquatic resources, depending on the type and quantity of the spill and the dispersal and attenuation characteristics of the waterbody.

Minimization and Mitigation Measures

Algonquin would minimize effects on aquatic resources through the use of various crossing methods, construction time windows, extra workspace restrictions, restoration procedures, and other mitigation measures. Where the wet open-cut crossing method is used, Algonquin would be required to complete in-stream pipeline removal and installation activities, excluding blasting activities, within 24 hours for minor waterbody crossings. Algonquin would attempt to complete in-stream pipeline removal and installation activities, excluding blasting activities, within 48 hours for intermediate waterbody crossings, unless site-specific conditions make completion with 48 hours infeasible. Algonquin would only conduct the crossings during the seasonal time windows specified in its E&SCP or state permits, and would generally locate temporary extra workspaces 50 feet back from the edge of waterbodies.

Algonquin would cross five waterbodies using either the HDD or horizontal bore method, which would avoid direct impacts on the bed and banks of the waterbody. Algonquin would cross all other coldwater and significant coldwater/warmwater streams using a dry crossing method such as the flume or dam and pump crossing method (see section 4.6.2.3). Use of the flume or dam and pump method effectively isolates the area of impact on the construction right-of-way and, thus, substantially avoids many of the impacts that are associated with wet open-cut crossings.

Algonquin would implement procedures to minimize potential impacts associated with loss of riparian shade and vegetation cover. Clearing of trees and other vegetation would be restricted to only what is necessary to safely construct and operate the pipelines. In most areas, the work areas required for the crossing would include the use of existing cleared rights-of-way, which would reduce tree clearing. This is particularly applicable along the Q-1 and E-3 System Replacements, which would be generally installed within the same trench as the original pipelines. Once construction is complete, streambeds and banks would be quickly restored to preconstruction conditions. Restoration, bank stabilization, and revegetation efforts as outlined in Algonquin's E&SCP would minimize the potential for erosion from the surrounding landscape. Adherence to the E&SCP would also maximize the potential for regrowth of riparian vegetation, thereby minimizing the potential for any long-term impacts associated with lack of shade and cover.

Implementation of Algonquin's construction, restoration, and mitigation procedures would minimize short-term impacts on fishery resources and the aquatic habitats upon which these fishery resources depend. Invertebrate populations would be expected to recolonize the crossing area and all temporary work areas would be returned to their original condition, including re-establishment of riparian cover. Furthermore, operation and routine maintenance of the pipeline rights-of-way and aboveground facilities, which would be restricted to clearing and mowing vegetation on the permanent right-of-way, would not have any noticeable impact on fishery resources within the proposed Project area.

Algonquin would mitigate the effects of blasting on aquatic resources through several means. The blasting contractor would use delays and measures to dampen the blast. The nature of the material that would require blasting and the short duration of blasting activities would minimize the amount of fine-grained material released to the aquatic habitat. Furthermore, resident fish inhabiting the area would be dispersed as a result of the active drilling for the blast holes and preparation of the construction work area at the crossing. When blasting is completed, debris would be removed so as not to interfere with downstream flow. The tie-in crews would then excavate the trench, install the pipeline, and restore the area in accordance with Algonquin's E&SCP.

Algonquin would minimize the potential impacts associated with hydrostatic testing by fitting withdrawal intake hoses with intake screen devices that would eliminate the entrainment of fingerling and small fish during water withdrawal. Discharges would comply with regulatory permit conditions and would be controlled to prevent scour and sedimentation, flooding, or the introduction of foreign or toxic substances into the aquatic system.

To minimize the potential for spills from equipment use, Algonquin would implement its SPCC Plan (see Appendix G). Refueling or other handling of hazardous materials within 100 feet of wetland and waterbody resources would not be allowed. If the 100-foot setback cannot be met, these activities would be performed under the supervision of an EI in accordance with the SPCC Plan. The SPCC Plan also specifies that Algonquin would conduct routine inspections of tank and storage areas to help reduce the potential for spills or leaks of hazardous materials.

4.6.2.3 Fisheries of Special Concern

Fisheries of special concern include waterbodies that support fisheries with important recreational value; contain coldwater fisheries; are included in special state fishery management regulations; or provide habitat for federally or state-listed endangered, threatened, or candidate fish species. Waterbodies that have significant economic value because of fish stocking programs, commercial fisheries, EFH (see section 4.6.2.4), or tribal harvest, are also considered fisheries of special concern.

Algonquin consulted with the FWS, NOAA Fisheries, the MassDFW, the MassDMF, and the CTIFD to identify waterbodies that may contain federally or state-listed endangered, threatened, or candidate fish species and their habitat; coldwater fisheries; and other fisheries resources that could be considered fisheries of special concern. Fisheries of special concern in the vicinity of the proposed Project include the Weymouth Fore River and Traphole Brook in Massachusetts and Norwichtown Brook, Hunter Brook, and the Shetucket River in Connecticut.

Weymouth Fore River

The Weymouth Fore River, which would be crossed by the I-10 Extension between MPs 0.0 and 1.2, is designated as EFH for a number of federally managed species and supports diadromous fish runs of the following species: blueback herring, Atlantic tomcod, alewife, rainbow smelt, and American eel (see section 4.6.2.4). Of particular concern to NOAA Fisheries and the MassDMF is the presence of winter flounder, which uses the Weymouth Fore River for spawning and feeding. The river also provides habitat for eggs, larvae, and juveniles that use the area during early life stage development (Chiarella, 2007). The intertidal mudflats, which are present in the near shore area of the Weymouth Fore River, have also been designated as a “special aquatic site” by the EPA.

Traphole Brook

Traphole Brook, which would be crossed by the Q-1 System Replacement at MP 13.9, is considered a significant coldwater resource by the MassDFW and supports both native brook trout and a reproducing population of brown trout. This waterbody has also been identified as having economic and recreational value because it is stocked annually with brook trout, brown trout, and/or rainbow trout (MassDFW, 2007).

Norwichtown and Hunter Brooks

The E-3 System Replacement would cross Norwichtown Brook at MP 0.6, which according to the CTIFD, supports a native brook trout population. The E-3 System Replacement would cross Hunter

Brook twice (MPs 3.3 and 3.4). Hunter Brook supports diadromous fish runs for striped bass, fourspine stickleback, and the American eel. Hunter Brook is also designated as a coldwater fishery by the CTIFD because it supports native brook trout, blacknose dace, longnose dace, and white sucker.

Shetucket River

The Shetucket River, which would be crossed by the E-3 System Replacement between MPs 3.4 and 3.9, has been designated by NOAA Fisheries as EFH for Atlantic salmon (see section 4.6.2.4). Atlantic salmon are an anadromous species, and both juveniles and adults use the river as a bidirectional migratory corridor to pass between breeding habitat and the ocean.

Commercial Fisheries

Waterbodies supporting commercial fisheries may be of particular concern because of the need to avoid, minimize, and mitigate for any economic impacts caused by construction within the waterbody. The only waterbody that supports commercial fisheries within the proposed E2W Project area is the Weymouth Fore River. The Weymouth Fore River supports life stages for several commercial fishery species, including various species of flounder.

Protected Fish Species

Algonquin consulted with the appropriate federal and state resource agencies to gather information on protected fish species. The results of these consultations indicate that no protected fish species are known to occur along the I-10 Extension, the Q-1 System Replacement, or the E-3 System Replacement (Chiarella, 2007; Murphy, 2007; French, 2007a; 2007b).

Site-specific Impacts and Mitigation for Special Concern Fisheries

As previously discussed, Algonquin proposes to use the HDD method to install the I-10 Extension under the Weymouth Fore River and the E-3 System Replacement under the Shetucket River and one of the two Hunter Brook crossings. Although the HDD method avoids in-stream impacts because it eliminates the need for in-stream excavation, it does not completely eliminate the possibility of impacts on aquatic resources due to the possibility of an inadvertent release of drilling mud or fluid into the waterbody (also referred to as a frac-out). Drilling mud primarily consists of water mixed with bentonite, which is a naturally occurring clay material, and possibly other non-toxic additives (e.g., sawdust, nut shells, bentonite pellets, or other commercially available non-toxic products) that could be needed to plug an inadvertent release. Impacts resulting from such a release would be localized and generally limited to individual fish in the immediate vicinity. The majority of highly mobile aquatic organisms, such as fish, would be able to avoid or move away from the affected area. However, some other less mobile or immobile organisms, such as mussels and other macroinvertebrates, in the area affected by the release could be smothered. There is also a possibility that vibrations resulting from drilling could affect diadromous fish migrations. The potential for this impact is minimal because the drill path would be far below the bed of the waterbody where the potential for noticeable vibration associated with the drill process would be negligible.

Algonquin has prepared an HDD Contingency Plan to be used in the event of the inadvertent release of drilling mud or in the event that an HDD fails (see Appendix I). The HDD Contingency Plan discusses the measures Algonquin would implement to minimize impacts from a release of drilling mud and discusses secondary measures in the event the original HDD profile cannot be completed. The HDD Contingency Plan is consistent with the best management practices developed for the HubLine and Maritimes Phase III Project to reduce potential impacts from frac-outs. Algonquin's use of the HDD

crossing method and other proposed mitigation measures would avoid or minimize direct impacts on aquatic resources within Hunter Brook and the Weymouth Fore and Shetucket Rivers.

Algonquin proposes to bore under Norwichtown Brook and use a dry crossing method to cross Traphole Brook and the first crossing of Hunter Brook. Potential impacts associated with these crossing methods are described in section 4.6.2.2. In accordance with Algonquin's E&SCP and the construction windows prescribed for coldwater fisheries by the MassDFW and the CTIFD, the in-stream work in these waterbodies would be conducted between June 1 and September 30. Algonquin's use of the bore or another dry crossing method and its implementation of its E&SCP would minimize impacts on fishery resources.

4.6.2.4 Essential Fish Habitat

The MSA (Public Law 94-265 as amended through January 12, 2007) was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, the ESA, or the Federal Power Act in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1) Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into an EIS, section 10 permit, etc.).

2) EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include: a description of the proposed action; an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; the federal agency's views regarding the effects of the action on EFH; and proposed mitigation, if applicable.

3) EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4) Agency Response – Within 30 days of receiving NOAA Fisheries' recommendations, the action agency must respond to NOAA Fisheries. The action agency may notify NOAA Fisheries that a full response to the conservation recommendations will be provided by a specified completion date agreeable to all parties. The full response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH. For any conservation recommendation that is not adopted, the action agency must explain its reason to NOAA Fisheries for not following the recommendation.

We propose to consolidate EFH consultations for the E2W Project with the interagency coordination procedures required under NEPA. Therefore, we are requesting consideration of this draft EIS as the FERC's EFH Assessment for the proposed Project. A discussion of EFH for the managed

species in the region and control measures and management practices that would mitigate potential EFH is presented below.

Managed Fish Species

NOAA Fisheries Northeast Regional Office (2007) EFH designation tables identify potential EFH within the Project area for 24 species in Massachusetts and 1 species in Connecticut. None of these managed stocks are endangered or threatened under the ESA. In Massachusetts, the EFH is associated with the Weymouth Fore River that would be crossed by the proposed I-10 Extension between MPs 0.0 and 1.2. In Connecticut, the EFH is associated with the Shetucket River that would be crossed by the proposed E-3 System Replacement between MPs 3.4 and 3.9. Table 4.6.2-2 summarizes EFH designations along the E2W Project. This information was primarily obtained from NOAA Fisheries' *Essential Fish Habitat Source Documents* prepared for individual species.

Due to the shallow depth (less than or equal to 3 meters) and muddy bottom of the pipeline crossing location of the Weymouth Fore River, the majority of the species listed above are unlikely to occur in the Project area. The two species that are most likely to occur in the Project area in Massachusetts are winter flounder and windowpane flounder. In Connecticut, Atlantic salmon adults and out-migrating smolts could occur temporarily in the pipeline crossing location of the Shetucket River.

NOAA Fisheries has requested that special attention be paid to potential impacts on winter flounder in the Weymouth Fore River and Atlantic salmon in the Shetucket River. These species are described in detail below.

Winter Flounder – Within the Weymouth Fore River, adult winter flounder use the waterbody for spawning and feeding, while eggs, larvae, and juveniles use the area for early life stage development (Chiarella, 2007). In southern New England, EFH for winter flounder eggs consists of bottom habitats with a substrate of sand, muddy sand, mud, and gravel. In general, the eggs are found in waters with temperatures less than 10 °C, salinities between 10 and 30 parts per thousand (ppt), and water depths less than 5 meters. In Massachusetts Bay, eggs are mostly common from January through July, peaking from February through May (Jury et al., 1994). EFH for winter flounder larvae are found in the pelagic and bottom waters of southern New England. Generally, the larvae are found in waters with surface temperatures less than 15 °C, salinities between 4 and 30 ppt, and water depths less than 6 meters. Larvae are present in Massachusetts Bay from February through August, peaking from March through May (Jury et al., 1994). EFH for juvenile winter flounder in southern New England includes bottom habitats with a substrate of mud or fine-grained sand. Young-of-the-year juveniles generally prefer waters with temperatures below 28 °C, salinities of 5 to 33 ppt, and depths ranging from 0.1 to 10 meters, and salinities between 5 and 33 ppt. Age 1+ juveniles generally prefer waters with temperatures below 25 °C, salinities of 10 to 30 ppt, and depths ranging from 1 to 50 meters. In southern New England, EFH for winter flounder adults consists of bottom habitats, including estuaries with a substrate of mud, sand, and gravel. Adults generally prefer waters with temperatures below 25 °C, salinities of 15 to 33 ppt, and depths ranging from 1 to 100 meters. Juveniles and adults are common year-round in Massachusetts Bay (Jury et al., 1994). Winter flounder are most often observed spawning from February through June. Spawning areas generally consist of bottom habitats with a substrate of sand, muddy sand, mud, and gravel; water temperatures below 15 °C; depths less than 6 meters; and salinities of 5.5 to 36 ppt. Winter flounder are most often observed spawning during the months of February to June.

TABLE 4.6.2-2

Summary of Essential Fish Habitat and General Habitat Parameters for the HubLine/East to West Project [a]

State/Facility/Waterbody/ EFH Species	Life Stage [b]	EFH Characteristics
Massachusetts		
I-10 Extension – Weymouth Fore River		
American plaice *Hippoglossoides platessoides*	**Egg**	Surface waters <12 C, 30-90 m
	Larvae	Surface waters <14 C, 30-130 m
	Juvenile	Sand/gravel bottom <17 C, 45-150 m
	Adult	Sand/gravel bottom <17 C, 45-175 m
	Spawning Adult	Wide range of bottom types <14 C, < 90 m
Atlantic butterfish *Peprilus triacanthus*	**Egg**	Pelagic waters, mixing/seawater portions of estuaries, 11-17 C, shore to 1,800 m
	Larvae	Pelagic waters, mixing/seawater portions of estuaries, 9-19 C, 10-1,800 m
	Juvenile	Pelagic waters, mixing/seawater portions of estuaries, 3-28 C, 10-365 m
	Adult	Pelagic waters, mixing/seawater portions of estuaries, 3-28 C, 10-365 m
	Spawning Adult	N/A
Atlantic cod *Gadus morhua*	**Egg**	Surface waters <12 C, <110 m, 32-33 ppt
	Larvae	Pelagic waters <10 C, 30-70 m, 32-33 ppt
	Juvenile	Cobble/gravel bottom <20 C, 25-75 m, 30-35 ppt
	Adult	Rock/pebble/gravel bottom 10 C, 10-150 m
	Spawning Adult	Smooth sand/rock/pebble/gravel bottom <10 C, 10-150 m
Atlantic halibut *Hippoglossus hippoglossus*	**Egg**	Pelagic waters to seafloor 4-7 C, <700 m, <35 ppt
	Larvae	Surface waters 30-35 ppt
	Juvenile	Sand/gravel/clay bottom >2 C, 20-60 m
	Adult	Sand/gravel/clay bottom <13.6 C, 100-700 m, 30.4-35.3 ppt
	Spawning Adult	Soft mud/clay/sand/gravel bottom <7 C, <700 m, <35 ppt
Atlantic mackerel *Scomber scombrus*	**Egg**	Pelagic waters, mixing/seawater portions of estuaries 5-23 C, shore to 15 m
	Larvae	Pelagic waters, mixing/seawater portions of estuaries 6-22 C, 10-130 m
	Juvenile	Pelagic waters, mixing/seawater portions of estuaries 4-22 C, shore to 320 m
	Adult	Pelagic waters, mixing/seawater portions of estuaries 4-16 C, shore to 380 m
	Spawning Adult	N/A
Atlantic sea herring *Clupea harengus*	Egg	Adhere to gravel/sand/cobble/shell fragment bottom <15 C, 20-80 m, 32-33 ppt, tidal currents 1.5-3 knots
	Larvae	Pelagic waters <16 C, 50-90 m, 32 ppt
	Juvenile	Pelagic waters and bottom habitats <10 C, 15-135 m, 26-32 ppt
	Adult	Pelagic waters and bottom habitats <10 C, 20-130 m, >28 ppt
	Spawning Adult	Gravel/sand/cobble/shell fragment bottom <15 C, 20-80 m, 32-33 ppt, tidal currents 1.5-3 knots
Atlantic sea scallop *Placopecten magellanicus*	**Egg**	Bottom habitat <17 C
	Larvae	Pelagic waters and sand/pebble/shell fragment bottom <18 C, 16.9-30 ppt
	Juvenile	Cobble/shell/silt bottom <15 C, 18-110 m
	Adult	Cobble/shells/coarse gravelly sand/sand bottom <21 C, 18-110 m, >16.5 ppt
	Spawning Adult	Cobble/shells/coarse gravelly sand/sand bottom <16 C, 18-110 m, >16.5 ppt

TABLE 4.6.2-2 (cont'd)

Summary of Essential Fish Habitat and General Habitat Parameters for the HubLine/East to West Project [a]

State/Facility/Waterbody/ EFH Species	Life Stage [b]	EFH Characteristics
Black sea bass *Centropristis striata*	Egg	Estuaries
	Larvae	Pelagic waters, mixing/seawater portions of estuaries, structured inshore habitat (sponge bed)
	Juvenile	Demersal waters, mixing/seawater portions of estuaries, rough bottom, shellfish/eelgrass beds, structures >6 C, >18 ppt
	Adult	Demersal waters, mixing/seawater portions of estuaries, structured habitat >6 C
	Spawning Adult	N/A
Bluefin tuna *Thunnus thynnus*	Egg	Pelagic and near coastal surface waters from North Carolina to Florida
	Larvae	Pelagic and near coastal surface waters from North Carolina to Florida
	Juvenile	Inshore and pelagic surface waters >12 C, 25-200 m
	Adult	Pelagic waters from the 50 m isobath to the EEZ boundary
	Spawning Adult	Pelagic and near coastal surface waters from North Carolina to Florida
Bluefish *Pomatomus salatrix*	Egg	Pelagic shelf waters >18 C, mid-shelf depths, >31 ppt
	Larvae	Pelagic waters >18 C, >15 m, >30 ppt
	Juvenile	Estuarine waters
	Adult	Estuarine waters >25 ppt
	Spawning Adult	N/A
Haddock *Melanogrammusaeglefinus*	**Egg**	Surface waters <10 C, 50-90 m, 34-36 ppt
	Larvae	Surface waters <14 C, 30-90 m, 34-36 ppt
	Juvenile	Pebble gravel bottom <11 C, 35-100 m, 31.5-34 ppt
	Adult	Broken ground/pebbles/smooth hard sand bottom <7 C, 40-150 m, 31.5-35 ppt
	Spawning Adult	Pebble gravel/gravelly sand bottom <6 C, 40-150 m, 31.5-34 ppt
Long finned squid *Loligo pealei*	**Juvenile**	Pelagic shelf waters 4-27 C, shore to 213 m
	Adult	Pelagic shelf waters 4-27 C, shore to 305 m
Ocean pout *Macrozoarces americanus*	**Egg**	Bottom habitats, sheltered nests/holes/crevices <10 C, <50 m, 32-24 ppt
	Larvae	Bottom habitats <10 C, <50 m, >25 ppt
	Juvenile	Bottom habitats, smooth bottom near rocks/algae <14 C, <80 m, >25 ppt
	Adult	Bottom habitats <15 C, <110 m, 32-34 m
	Spawning Adult	Hard bottom habitats/artificial reefs <10 C, <50 m, 32-34 ppt
Pollock *Pollachius virens*	**Egg**	Pelagic waters <17 C, 30-270 m, 32-32.8 ppt
	Larvae	Pelagic waters <17 C, 10-250 m
	Juvenile	Sand/mud/rock/aquatic vegetation bottom <18 C, 0-250 m, 29-32 ppt
	Adult	Bottom habitats <14 C, 15-365 m, 31-34 ppt
	Spawning Adult	Hard bottom habitats/artificial reefs <8 C, 15-365 m, 32-32.8 ppt
Red hake *Urophycis chuss*	**Egg**	Surface waters <10 C, <25 ppt
	Larvae	Surface waters <19 C, <200 m, >0.5 ppt
	Juvenile	Shell fragment bottom habitats <16 C, <100 m, 31-33 ppt
	Adult	Sand/mud bottom depressions <12 C, 10-130 m, 33-34 ppt
	Spawning Adult	Sand/mud bottom depressions <10 C, <100 m, <25 ppt

TABLE 4.6.2-2 (cont'd)

Summary of Essential Fish Habitat and General Habitat Parameters for the HubLine/East to West Project [a]

State/Facility/Waterbody/ EFH Species	Life Stage [b]	EFH Characteristics
Scup	Egg	Mixing/seawater portions of estuaries 13-23 C, >15 ppt
Stenotomus chrysops	Larvae	Mixing/seawater portions of estuaries 13-23 C, >15 ppt
	Juvenile	Demersal waters, mixing/seawater portions of estuaries, sand/mud/mussel and eelgrass beds >7 C, >15 ppt
	Adult	Demersal waters, mixing/seawater portions of estuaries, >7 C
	Spawning Adult	
Short finned squid	**Juvenile**	Pelagic shelf waters 2-23 C, shore to 183 m
Illex illecebrosus	**Adult**	Pelagic shelf waters 4-19 C, shore to 183 m
Summer flounder	Egg	Pelagic shelf waters, 9-110 m
Paralicthys dentatus	Larvae	Pelagic shelf waters, mixing/seawater portions of estuaries, nearshore 10-70 m
	Juvenile	Demersal waters, mixing/seawater portions of estuaries, salt marsh creeks/ seagrass beds/mudflats/open bays >3 C, 10-30 ppt
	Adult	Demersal waters, shallow mixing/seawater portions of estuaries, shallow coastal waters
	Spawning Adult	N/A
Surf clam	**Juvenile**	Buried to a depth of 1 m, in waters from the beach zone to 60 m
Spisula solidissima	**Adult**	Buried to a depth of 1 m, in waters from the beach zone to 60 m
White hake	**Egg**	Surface waters
Urophycis tenuis	**Larvae**	Pelagic waters
	Pelagic Juvenile	Pelagic waters
	Demersal Juvenile	Mud/fine sand/seagrass bed bottom <19 C, 5-325 m
	Adult	Mud/fine sand bottom <14 C, 5-325 m
	Spawning Adult	Mud/fine sand bottom <14 C, 5-325 m
Whiting	**Egg**	Surface waters <20 C, 50-150 m
Merluccius bilinearis	**Larvae**	Surface waters <20 C, 50-130 m
	Juvenile	Bottom habitats <21 C, 20-270 m, >20 ppt
	Adult	Bottom habitats <22 C, 30-325 m
	Spawning Adult	Bottom habitats <13 C, 30-325 m
Windowpane flounder	**Egg**	Surface waters, <20 C, <70 m
Scophthalmus aquosus	**Larvae**	Pelagic waters, <20 C, <70 m
	Juvenile	Mud/fine sand bottom habitats <25 C, 1-100 m, 5.5-36 ppt
	Adult	Mud/fine sand bottom habitats <26.8 C, 1-75 m, 5.5-36 ppt
	Spawning Adult	Mud/fine sand bottom habitats <21 C, 1-75 m, 5.5-36 ppt
Winter flounder	**Egg**	Sand/muddy sand/mud/gravel bottom <10 C, <5 m, 10-30 ppt
Pleuronectes americanus	**Larvae**	Pelagic and bottom waters <15 C, <6 m, 4-30 ppt
	Young of the year Juvenile	Mud/fine sand bottom habitats <28 C, 0.1-10 m, 5-33 ppt
	Age 1+ Juvenile	Mud/fine sand bottom habitats <25 C, 1-50 m, 10-30 ppt
	Adult	Mud/sand/gravel estuarine bottom habitats <25 C, 1-100 m, 15-33 ppt
	Spawning Adult	Sand/muddy sand/mud/gravel bottom habitats <15 C, <6 m, 5.5-36 ppt

TABLE 4.6.2-2 (cont'd)

Summary of Essential Fish Habitat and General Habitat Parameters for the HubLine/East to West Project [a]

State/Facility/Waterbody/ EFH Species	Life Stage [b]	EFH Characteristics
Yellowtail flounder	**Egg**	Surface waters <15 C, 30-90 m, 32.4-33.5 ppt
Pleuronectes ferruginea	**Larvae**	Surface waters <17 C, 10-90 m, 32.4-33.5 ppt
	Juvenile	Sand/mud bottom <15 C, 20-50 m, 32.4-33.5 ppt
	Adult	Sand/mud bottom <15 C, 20-50 m, 32.4-33.5 ppt
	Spawning Adult	Sand/mud bottom <17 C, 10-125 m, 32.4-33.5 ppt
Connecticut		
E-3 System Replacement – Shetucket River		
Atlantic salmon [c]	Egg	Gravel/cobble riffle bottom, well-oxygenated fresh water <10 C
Salmo salar	Larvae	Gravel/cobble riffle bottom, well-oxygenated fresh water <10 C
	Juvenile	Gravel/cobble riffle bottom, well-oxygenated fresh water <25 C, 0.1-0.6 m, water velocity of 30-92 cm per second
	Migrating Adult	Resting/holding pools in rivers and estuaries <22.8 C, dissolved oxygen >5 ppm
	Spawning Adult	Gravel/cobble riffle bottom, well-oxygenated fresh water <10 C, 0.3-0.6 m, water velocity of 61 cm per second

[a] 10' x10' square coordinates: 42° 20.0' N, 70° 50.0' W, 42° 10.0' N, 71° 00.0' W.

[b] Respective life stages in bold type have designated EFH.

[c] EFH designation for the Atlantic salmon is based on Connecticut River data from NOAA Fisheries.

Note: N/A = Information not available
C = ° Celsius
m = meters
ppt = parts per thousand
ppm = parts per million

As recently as 2004, the southern New England stock of winter flounder was determined to be in an overfished condition, and overfishing continues to occur (NOAA Fisheries, 2006a).

Atlantic Salmon – The Shetucket River is designated as EFH for Atlantic salmon where it would be crossed by the E-3 System Replacement. Atlantic salmon use the river as a migratory corridor (Chiarella, 2007).

The life history of Atlantic salmon is complex due to its use of both freshwater and marine habitats and long ocean migrations. Atlantic salmon adults spawn in freshwater during the fall. Where migrating salmon are found, water temperatures are typically below 22.8 °C with dissolved oxygen above 5 parts per million. River habitats for spawning adults include resting and holding pools. The eggs remain in gravel substrates and hatch during the winter, with fry emerging in the spring. Depending on growth, these juveniles remain in freshwater for 1 to 3 years in New England rivers (NOAA Fisheries, 2006b). Juvenile Atlantic salmon use bottom habitats with gravel or cobble riffles above or below a pool of rivers. Between March and June, Atlantic salmon juveniles are generally found in clean, well-oxygenated fresh waters with temperatures below 10 °C. When the juveniles reach a size of greater than 13 centimeters, they develop into smolts and migrate to the ocean in the spring (NOAA Fisheries, 2006b).

Potential Effects on EFH

Algonquin proposes to cross the Weymouth Fore River and the Shetucket River using the HDD method. This EFH assessment only addresses the potential impact of Algonquin's proposed HDD crossings of these waterbodies. Based on the results of the geotechnical investigations, it appears that the HDDs are feasible. Therefore, other crossing methods are not evaluated in this assessment.

Successful use of the HDD method is considered an effective technique for avoidance of in-stream impacts by eliminating the need for in-stream construction (Reid et al., 2004). Because the pipeline segments would be installed beneath the Weymouth Fore and Shetucket Rivers, impacts on the bed, banks, and EFH would be avoided. However, there are potential impacts associated with the use of the HDD method. These potential impacts include:

- erosion or sedimentation associated with onshore operation of the HDD equipment;
- inadvertent hazardous material spills associated with the operation of construction equipment; and
- inadvertent releases of drilling mud (also referred to as frac-outs).

Construction related to onshore operation of the HDD equipment could cause run-off of sediment into the waterbody, which could adversely affect EFH. Also, accidental spills of petroleum products or hazardous materials into or near the waterbody could be toxic to any life stage, depending on the type and quantity of the spill.

Construction using the HDD method could result in a frac-out directly or indirectly into the waterbody. Drilling mud may leak through previously unidentified fractures in the material underlying the riverbed, in the area of the mud pits or tanks, or along the path of the drill due to unfavorable ground conditions. The probability of an inadvertent release of drilling mud is greatest when the drill bit is working near the surface (i.e., near the entry and exit points); however, the risk is dependent on numerous factors including substrate characteristics, head pressure of the drilling mud, topography, elevation, and subsurface hydrology.

Although drilling mud consists of naturally occurring non-toxic materials, such as bentonite clay and water, the release of large quantities of drilling mud into a waterbody could affect fisheries or other aquatic organisms by settling and temporarily inundating the habitats used by these species. Bentonite by itself is essentially non-toxic (Breteler et al., 1985; Hartman and Martin, 1984; Sprague and Logan, 1979) and chemical toxicity of drilling muds would not exist without toxic additives. However, bentonite, as with any fine particulate material, can interfere with oxygen exchange by the gills of aquatic organisms (EPA, 1986). The degree of interference generally increases with water temperature (Horkel and Pearson, 1976). Impacts would be localized and would generally be limited to individual fish in the immediate vicinity of the frac-out. The majority of highly mobile aquatic organisms, such as fish, would be able to avoid or move away from the affected area. Other less mobile or immobile organisms, such as mussels and other macroinvertebrates that are affected by the frac-out, could be harmed or killed.

The potential for a frac-out to impact fish eggs and larvae depends upon the species, the concentration of particles, and the duration of exposure. Demersal eggs such as those of the winter flounder may be partially or completely covered by fine particles if those particles settle to the bottom. This may slow the exchange of oxygen between the water and egg and therefore slow development or cause eggs to experience higher mortality rates (Wilbur and Clarke, 2001). In general, however, exposure to increased turbidity for periods of less than 1 day appears to have little measurable effect on pelagic fish eggs and larvae (Kiorboe et al., 1981; Wilbur and Clarke, 2001).

In addition to the potential for HDD-related effects, EFH could also be affected by impingement/ entrainment associated with water withdrawals for hydrostatic testing, drilling mud make-up water, or dust control. Project effects could include entrainment or impingement of adult and juvenile fish, larvae, or eggs during water withdrawals. The potential for entrainment or impingement would depend on a variety of factors, including but not limited to the time of year and the distribution of the eggs/larvae within the water column relative to the water withdrawal intakes.

Winter Flounder – Winter flounder eggs may be present in the Project area from January through June. Winter flounder eggs and larvae are demersal and, therefore, should not experience significant entrainment if water from the Weymouth Fore River is withdrawn for hydrostatic testing or other Project uses.

As discussed above, in the event of a frac-out, eggs present on the substrate could be partially or completely buried by fine particles. This may adversely affect the growth and survival rates of winter flounder eggs, and sedimentation in excess of approximately 3 millimeters would likely cause egg mortality. Winter flounder adults may experience gill clogging or abrasion related to the elevated suspended sediments, but would likely move out of the area of the frac-out and not suffer direct mortality. Winter flounder prey species (i.e., benthic invertebrates) could suffer mortality or be temporarily disturbed. However, these effects would be localized and temporary, and the benthic invertebrates would likely recolonize the impacted area over a period of weeks to months, depending on the resident species and the residence time of the bentonite.

Atlantic Salmon – As discussed above, seasonal migrations of Atlantic salmon occur within the Shetucket River. Migratory fish populations could be impacted by increased concentrations of suspended drilling mud if a frac-out were to occur during migratory periods. High concentrations of suspended drilling mud may delay or divert migratory passage and in some instances could cause total avoidance of an area by fish. These potential effects could be exacerbated if the migrating fish are in generally poor condition and under stress by other factors. However, increased turbidity from a frac-out would not significantly disrupt Atlantic salmon in the Shetucket River. These fish generally ascend rivers when flows and, consequently turbidity, are high and are quite tolerant of high turbidity conditions. Juveniles and adults are highly mobile and would likely move out of areas of inadequate water quality. The

volumes of bentonite that could be inadvertently released would be localized and unlikely to cause enough turbidity to temporarily restrict passage across the entire width of the waterbody.

Clearing in the riparian area of the Shetucket River would not be required for construction or future maintenance. Therefore, impacts from the operation of the pipeline are not anticipated.

Cumulative Impacts

Cumulative impact results when impacts associated with a proposed Project are superimposed on or added to impacts associated with past, present, or reasonably foreseeable future projects within the area affected by the proposed Project. Although the individual impacts of the individual projects might be minor, the additive effects from all of the projects could be significant.

Because the Weymouth Fore and Shetucket Rivers would be crossed by use of the HDD method, the potential EFH impacts are minor and would not significantly contribute to existing EFH impacts in the Project area.

Conservation Measures

Algonquin would be required to comply with a number of regulatory requirements and programs designed specifically to protect aquatic resources. In addition, Algonquin has prepared an E&SCP to minimize potential impacts associated with erosion and sedimentation (see Appendix F). With the exception of a staging area located adjacent to the Weymouth Fore River on the HDD entry side, the remaining staging areas associated with the HDDs for the Weymouth Fore and Shetucket Rivers would be set back between 100 and 1,500 feet from the EFH resources associated with the rivers. The implementation of the E&SCP and the setback of the workspaces would minimize the potential impacts of erosion or sedimentation associated with onshore operations of the HDD equipment.

Algonquin would also implement its SPCC Plan, which addresses preventive and mitigative measures that would be used to avoid or minimize the potential impact of petroleum or hazardous material spills during pipeline construction (see Appendix G). This plan includes provisions that prohibit the storage of fuel and other potentially toxic materials within specified distances of waterbodies, and procedures for refueling equipment that are designed to minimize potential spills. The SPCC Plan also outlines procedures for containing, cleaning up, and reporting spills. Implementation of the SPCC Plan would minimize the potential impacts of hazardous material spills associated with the operation of construction equipment.

The pipeline segments installed using the HDD method would be hydrostatically tested in a manner that would avoid adverse impacts on EFH. Algonquin has identified the Weymouth Fore River and Shetucket River as potential sources of hydrostatic test water that would be used for the I-10 Extension and E-3 System Replacement, respectively. Hydrostatic test water withdrawal intake hoses would be fitted with screen devices to minimize the potential for impingement and entrainment of aquatic organisms. Algonquin does not anticipate using chemicals or additives for hydrostatic testing or drying of the pipeline following hydrostatic testing. The discharge of hydrostatic test water would comply with regulatory permit conditions and would be controlled in order to prevent scour and sedimentation, flooding, or the introduction of foreign or toxic substances into the waterbodies. Additional details of hydrostatic testing procedures are provided in section 4.3.2.10.

Because the staging areas for the HDDs would be set back from the banks of the waterbodies, the potential for a frac-out to occur in the water would be minimized. The bentonite clay slurry is denser than water and would settle in the immediate vicinity of the frac-out location. Algonquin's HDD Contingency

Plan describes the agency notification procedures and the corrective action and cleanup procedures that would be followed in the event of a frac-out and the procedures that would be followed if it is necessary to abandon the drill hole (see Appendix I). The HDD Contingency Plan also discusses the secondary procedure that would be implemented if the original bore hole cannot be completed. The HDD Contingency Plan does not, however, identify Algonquin's water source for mixing of drilling muds. To ensure all Project-related surface water withdrawals are identified in consideration of potential impacts on aquatic resources and EFH, we are recommending in section 4.3.2.4 that Algonquin revise its HDD Contingency Plan to specify the sources of water that would be used for the mixing of drilling mud and provide that information to us during the draft EIS comment period. Additional discussion of the HDD Contingency Plan is presented in section 4.3.2.4.

Conclusions of the EFH Assessment

Use of the HDD method for the crossings of the Weymouth Fore and Shetucket Rivers would minimize impacts on the bed, banks, and EFH associated with these waterbodies. There are potential impacts associated with the HDD method; however, none of these effects are expected to be significant due to the small area that would be affected and the relatively short duration of construction. Additionally, Algonquin's implementation of the conservation measures discussed above and continued coordination with the applicable resource agencies would likely avoid or minimize impacts on managed fish species and designated EFH.

4.6.3 NSTAR Alternative

4.6.3.1 Wildlife

The wildlife communities identified along the NSTAR Alternative would be similar to those found along the I-10 Extension and Q-1 System Replacement.

The predominant wildlife habitat type that would be crossed by the NSTAR Alternative is early successional-upland scrub-shrub. Forest land (upland and wetland forest) is the second most prevalent habitat. Construction of the NSTAR Alternative would disturb approximately 29.4 acres of wildlife habitat comprising 7.5 acres of forested wildlife habitat (6.8 acres of upland forest and 0.7 acre of wetland forest); about 1.2 acres of open, non-forested wetland; and approximately 20.7 acres of early successional-upland scrub-shrub wildlife habitat (open land, old fields, utility rights-of-way, etc.). The corresponding segment of the proposed route would affect 25.9 acres more forest land and 1.9 acres more open, non-forested wetland habitat, but 17.8 acres less early successional-upland scrub-shrub wildlife habitat. In general, wetland wildlife habitat impacts associated with the NSTAR Alternative would be similar in nature to the wetland impacts along the proposed route. The NSTAR Alternative would be parallel to existing rights-of-way for approximately 1.4 miles compared to the corresponding segment of the proposed route, which would be parallel or adjacent to existing rights-of-way for approximately 1.1 miles. The NSTAR Alternative would also result in less new right-of-way than the corresponding segment of the proposed route (1.3 miles for the NSTAR Alternative versus 2.4 miles for the proposed route).

Only one permanent access road would be located along the NSTAR Alternative. Approximately 0.1 acre of upland forest would be affected by construction and operation of this access road. No permanent access roads would be located along the corresponding segment of the proposed route. Four potential vernal pools were identified within 150 feet of the construction right-of-way along the NSTAR Alternative compared to nine potential vernal pools within 150 feet of the construction work area of the corresponding segment of the proposed route. The NSTAR Alternative does not cross any ACECs or Priority or Estimated Habitats.

4.6.3.2 Aquatic Resources

The aquatic resources that inhabit the waterbodies that would be crossed by the NSTAR Alternative are similar to those that would be crossed by the corresponding segment of the I-10 Extension.

The NSTAR Alternative would cross two perennial and two intermittent streams, all of which would be crossed using the wet open-cut method. The corresponding segment of the proposed route would cross two perennial waterbodies and one intermittent waterbody that would also be crossed using the wet open-cut method.

4.7 SPECIAL STATUS SPECIES

4.7.1 Regulatory Requirements and Species Identification

Federal agencies are required by section 7 of the ESA (Title 19 USC Part 1536(c)), as amended (1978, 1979, and 1982), to ensure that any actions authorized, funded, or carried out by the agency do not jeopardize the continued existence of a federally listed endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. The action agency (i.e., the FERC) is required to consult with the FWS and/or NOAA Fisheries to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the proposed Project, and to determine the proposed action's potential effects on those species or critical habitats. For actions involving major construction activities with the potential to affect listed species or designated critical habitat, the FERC must report its findings to the FWS and NOAA Fisheries in a Biological Assessment (BA) for those species that may be affected. The FERC must submit its BA to the FWS and/or NOAA Fisheries and, if it is determined that the action may adversely affect a listed species, the federal agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

The ESA protects fish, wildlife, plants, and invertebrates that are federally listed as threatened or endangered. A federally listed endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A federally listed threatened species is likely to become endangered in the foreseeable future throughout all or a significant portion of its range. The FWS, which is responsible for terrestrial and freshwater species, and NOAA Fisheries, which is responsible for marine species, jointly administer the law.

Protection is also afforded under the ESA to "critical habitat," which the FWS defines as specific areas both within and outside the geographic area occupied by a species on which are found those physical and biological features essential to its conservation. In addition to federal law, both Massachusetts and Connecticut have passed laws to protect state-listed endangered and threatened species. The state-specific regulations are as follows:

- The MESA (Massachusetts General Law (M.G.L.) section 131A); and
- The Connecticut Endangered Species Act (CGS section 26-303).

Algonquin, as our non-federal representative, conducted informal consultations with federal and state resource agencies to determine if any federally or state-listed endangered or threatened species (including federal and state species of special concern) or their designated critical habitats occur within the proposed E2W Project area. These consultations included the area crossed by the pipelines as well as the Rehoboth Compressor Station site, other aboveground facility sites, and the pipe storage and contractor ware yards. Agencies contacted by Algonquin included the New England Office of the FWS, NOAA Fisheries Northeast Region, the MassNHESP, and the CTNDDB.

We have reviewed the information submitted by Algonquin as a result of its agency consultations to assess impacts on special status species. Based on these informal consultations, no federally listed species or their designated critical habitats potentially occur in the general vicinity of the proposed E2W Project. Therefore, we have determined there would be no impacts on federally listed species or their designated critical habitats (Tur, 2007; Chiarella, 2007).

Consultations with the MassNHESP identified two significant wildlife habitat types including Estimated Habitats of rare wetlands wildlife and Priority Habitats of rare species and exemplary communities. Consultations with the MassNHESP and the Massachusetts Audubon Society identified one state-endangered species (dwarf rattlesnake plantain) and six Massachusetts special concern species (blue-spotted salamander, Eastern box turtle, mocha emerald dragonfly, eastern pondmussel, oak hairstreak butterfly, and tall-nut sedge) as potentially occurring along the proposed Project in Massachusetts (Marold, 2008a-d; Massachusetts Audubon Society, 2007). Consultations with the CTNDDB did not identify any state-listed species along the proposed Project in Connecticut (Victoria, 2007). Therefore, we conclude that no impacts on rare wildlife species or habitats would occur in Connecticut.

The general impacts of the Project on special status species are discussed in section 4.7.2. A detailed discussion of the Estimated and Priority Habitats and seven state-listed species identified within the Project area in Massachusetts, the results of Algonquin's surveys for these species, and its proposed conservation measures to minimize the impacts of the E2W Project on these species is provided in section 4.7.3.

4.7.2 General Impact

In general, the impacts of the proposed Project on special status species and their habitats would be similar to those described for non-listed wildlife species. However, the magnitude and duration of these impacts could be greater for special status species because their distribution and relative abundance usually are more limited than the other species discussed in section 4.6. Construction could remove special status plants inhabiting the construction right-of-way and could disturb, displace, or harm special status animals on and adjacent to construction work areas. Construction could also affect special status plants and wildlife by temporarily altering the habitat along the pipeline right-of-way and permanently altering the habitat at the Rehoboth Compressor Station site. These impacts would be limited by the fact that the majority of the proposed pipeline rights-of-way would be within or immediately adjacent to Algonquin's or NSTAR's existing rights-of-way. Construction and operation of the aboveground facilities would result in permanent impacts on vegetative cover, thereby removing wildlife habitat. However, none of the areas where these facilities would be located are considered Priority or Estimated Habitat. As such, vegetation clearing would not create substantial fragmentation of special status species habitat.

4.7.3 State-listed Endangered and Threatened Species

State-listed species identified by the MassNHESP and Massachusetts Audubon Society and their associated Priority and Estimated Habitats that would be crossed by the E2W Project are summarized in table 4.7.3-1 and described below. As discussed in section 4.7.1, the CTNDDB did not identify any records of the occurrence of state-listed species along the E-3 System Replacement in Connecticut.

TABLE 4.7.3-1

State-listed Species and Associated Priority and Estimated Habitats Identified Within the HubLine/East to West Project Area

State/Facility/Species	Approximate Milepost	Habitat Designation	State Status
Massachusetts			
I-10 Extension			
Blue-spotted salamander (*Ambystoma laterale*)	5.2-7.5	PH 76/EH 760	Special Concern Species
Eastern box turtle (*Terrapene carolina*)	3.8-7.8	PH 76/EH 760	Special Concern Species
Mocha emerald dragonfly (*Somatochlora linearis*)	5.2-7.5	PH 76/EH 760	Special Concern Species
Q-1 System Replacement			
Dwarf rattlesnake plantain (*Goodyera repens*)	12.2-12.4 13.7-14.4	N/A	Endangered
Eastern box turtle (*Terrapene carolina*)	12.0-16.7	N/A	Special Concern Species
Eastern pondmussel (*Ligumia nasuta*)	16.3	N/A	Special Concern Species
Oak hairstreak butterfly (*Satyrium favonius*)	13.0-14.1	PH 800	Special Concern Species
Tall-nut sedge (*Scleria triglometra*)	12.5	N/A	Special Concern Species
Bridle shiner (*Notropis bifrenatus*)	[a]	PH 296/EH 714	Special Concern Species
Rehoboth Compressor Station	- None -		
OPP Regulator Stations	- None -		
Connecticut			
E-3 System Replacement	- None -		

[a] The portion of the proposed Project where the bridle shiner was identified by the MassNHESP as occurring is no longer part of the proposed Project.

Note: PH = Priority Habitat; EH = Estimated Habitat.

N/A = Not applicable.

Within Massachusetts, the I-10 Extension and Q-1 System Replacement pipeline routes each cross one mapped rare species habitat classified as Priority/Estimated Habitat by the MassNHESP. No state-listed species of plants or wildlife or any mapped Priority/Estimated Habitats would be located at or near the proposed Rehoboth Compressor Station, the OPP regulator stations, the pipe storage and contractor ware yards, or access roads.

The I-10 Extension would cross Priority Habitat 76/Estimated Habitat 760 (PH 76/EH 760) in Holbrook and Braintree, Massachusetts. PH 76/EH 760 provides habitat for the following species of special concern: blue-spotted salamander (*Ambystoma laterale*); Eastern box turtle (*Terrapin carolina*); and mocha emerald dragonfly (*Somatochlora linearis*) (MassDFW, 2007). The Q-1 System Replacement would cross Priority Habitat 800 (PH 800) in Sharon, Massachusetts. PH 800 provides habitat for the oak hairstreak (*Satyrium favonius*), a butterfly species that is listed as a state special concern species (MassDFW, 2007). Maps showing these Priority Habitats are included in Appendix N.

The MassNHESP provided Algonquin with additional information on the occurrence of other state-listed species along the Q-1 System Replacement in Massachusetts, including the tall-nut sedge (*Scleria triglometra*), the bridle shiner (*Notropis bifrenatus*), and the Eastern pondmussel (*Ligumia nasuta*).

The MassNHESP identified the bridle shiner occurring within Priority Habitat 296 (PH 296) and Estimated Habitat 714 (EH 714) (French, 2007a; 2007b), which were originally crossed by a portion of Algonquin's proposed Project. However, the proposed Project no longer crosses PH 296/EH 714. Therefore, we conclude that the E2W Project would not have an adverse impact on the bridle shiner. The MassNHESP concurred with this determination in its June 3, 2008 correspondence with Algonquin. In this correspondence it stated that no further MESA review or further assessment is necessary for the bridle shiner if no work occurs within the mapped habitat for this species.

Although not identified by MassGIS or the MassNHESP, the Massachusetts Audubon Society indicated that habitat for the state-endangered dwarf rattlesnake plantain (*Goodyera repens*) was identified on its property within the Moose Hill Wildlife Sanctuary in Sharon, Massachusetts that would be crossed by the Q-1 System Replacement between MPs 12.2 and 12.4 and MPs 13.7 and 14.4 (Massachusetts Audubon Society, 2007).

The Priority/Estimated Habitats and the species and issues identified by the MassNHESP during Algonquin's consultations (Marold, 2008a-d) are discussed below along with Algonquin's survey efforts and the survey results obtained to date.

On September 12, 2008, Algonquin met with the MassNHESP to review the spring and summer special status species survey results, address any outstanding survey needs, and discuss potential conservation measures and permit timeframes. As a result of this meeting, conservation measures, as discussed below, were developed to avoid or minimize potential impacts on special status species. These conservation measures are considered draft conservation measures until Algonquin completes its preapplication consultation and submits its formal MESA application to the MassNHESP in late October 2008. The formal MESA application would include Algonquin's final proposed conservation measures. Algonquin has stated that its formal MESA application would be filed with the FERC when available.

4.7.3.1 Blue-spotted Salamander

The blue-spotted salamander is a Massachusetts special concern species. It is a member of the mole salamanders and is generally found in upland habitats consisting of moist and shaded forested areas with typical vegetation assemblages including mixed hardwoods and hemlock (MassNHESP, 2007a). Adults range from 4.0 to 5.5 inches in total length and are typically dark blue to black with light blue spots or speckling along the lower sides of the body (MassNHESP, 2007a). Its breeding season extends from mid-March to late April. Adult blue-spotted salamanders emerge and migrate to vernal pools or ephemeral ponds for breeding. Eggs are laid singly or in small masses and are usually attached to twigs or vegetation within the pool. Eggs hatch within 30 days and the aquatic larvae transform into adults and leave the breeding pools by late August (MassNHESP, 2007a).

The MassNHESP has a record of the blue-spotted salamander occurring within PH 76/EH 760 (French, 2007a; 2007b). PH 76/EH 760 is located in the Towns of Holbrook and Braintree and would be crossed by the I-10 Extension from approximate MPs 5.2 to 7.5. PH 76/EH 760 also overlaps with the Cranberry Brook Watershed ACEC. In response to recommendations from the MassNHESP, Algonquin conducted a comprehensive habitat assessment within this designated habitat area to identify potential blue-spotted salamander breeding habitat (Algonquin, 2008b). Using the habitat assessment as a baseline, Algonquin planned and executed an intensive breeding pool trapping program from March to April 2008 in consultation with the MassNHESP to confirm the presence or absence of this species within the proposed Project area. Algonquin placed traps in five potential breeding habitats along the I-10 Extension route within PH 76/EH 760. No blue-spotted salamanders were captured at any of the potential habitats. In addition, Project-wide surveys were conducted during April 2008 to document the presence of vernal

pools (see section 4.6.1.4). No blue-spotted salamander breeding evidence was identified during this survey effort. No further surveys were recommended by the MassNHESP.

Algonquin provided its survey report for the blue-spotted salamander trapping program to the MassNHESP. Based on the survey results and proposed protection measures, Algonquin is requesting the MassNHESP's concurrence with a finding of no adverse impact as part of the final MESA review. In an e-mail dated June 3, 2008 to Algonquin, the MassNHESP indicated that it anticipates a finding of no "take" for the blue-spotted salamander and that the survey results, impact analysis, and conservation measures should be addressed in Algonquin's final MESA application.

On September 12, 2008, Algonquin met with the MassNHESP to discuss survey results and the certified vernal pool (CVP B-VP-4) at MP 6.5 of the I-10 Extension that serves as potential breeding habitat for the blue-spotted salamander. During this meeting, the MassNHESP expressed concern regarding the potential impacts on this vernal pool, even though no blue-spotted salamanders were identified during trapping surveys. To address these concerns, Algonquin met with MassNHESP staff in the field on September 17, 2008 to evaluate the habitat and to discuss construction and potential avoidance, minimization, and mitigation measures. Based on these discussions, Algonquin has proposed conservation measures aimed to minimize impacts on this vernal pool. The MassNHESP requested that the bore method be adopted to install the pipeline to avoid direct impacts on this vernal pool (see section 4.6.1.4). However, Algonquin's evaluation of this method revealed that it would not be consistent with the MassNHESP's overall goal of minimizing impact on upland and wetland forests within 300 feet of vernal pools. Alternatively, Algonquin proposes to employ the stove-pipe construction method to install the pipeline to minimize workspace and associated impacts on the vernal pool and adjacent forested habitats. The stove-pipe construction method is described in section 2.3.2. Use of this method would result in a decrease of 0.4 acre of disturbance to this vernal pool, of which 0.2 would be forested impact.

In addition to this minimization measure, Algonquin has proposed additional preconstruction conservation measures to be implemented at this vernal pool. These measures include vegetation sampling to quantify the species and composition of plant species; a microtopography assessment to develop a detailed restoration plan for use during construction; biological surveys to determine vernal pool indicator species; and an invasive species survey to quantify the species composition and location of invasive species found within, and in close proximity to, the vernal pool.

Algonquin also proposes to employ conservation measures during the construction phase including: 1) time-of-year restrictions (no trenching across the vernal pool until after September 1); 2) habitat impact minimization measures including signing/fencing, equipment mats, no refueling zones within 100 feet of the vernal pool, installation of erosion control devices with "critter gaps," wetland topsoil segregation, and habitat restoration. Although we concur with the use of erosion control devices to prevent the movement of sediment from the work area, we disagree with the use of critter gaps in the erosion control devices that could allow individual salamanders to enter the construction work area during active construction. In our opinion, the installation of erosion control devices with no gaps followed by daily preconstruction sweeps of the construction work area to relocate any salamanders from the work area would provide a greater degree of protection to the species. The erosion control devices should also be designed to incorporate turnarounds at their ends to redirect animals away from the designated work areas. Algonquin is also proposing post-construction conservation measures such as vegetation sampling, biological surveys, and surveys for invasive plant species. As discussed above, these conservation measures are considered to be draft measures and will be finalized after Algonquin completes additional consultations with the MassNHESP. In section 4.7.4, we are recommending that Algonquin file the comments of the MassNHESP on its final MESA application and any additional consultation and clearance letters.

Because no blue-spotted salamanders were captured during the intensive trapping program along the I-10 Extension, we conclude that construction of the I-10 Extension within PH 76/EH 760 and the Cranberry Brook Watershed ACEC would not have an adverse impact on the blue-spotted salamander. Further, we conclude that incorporation of the conservation measures identified during Algonquin's meeting with the MassNHESP would minimize impact on the certified vernal pool at MP 6.5 of the I-10 Extension. Algonquin would also implement measures in its E&SCP and wetland crossing procedures to further minimize impacts on wetlands in this area and along the entire Project route.

4.7.3.2 Eastern Box Turtle

The Eastern box turtle is a Massachusetts special concern species. It is a terrestrial turtle species that inhabits a variety of habitats in Massachusetts, including dry and moist woodlands, brushy fields, thickets, marsh edges, streambanks, and well-drained bottomlands. Eastern box turtles are active from mid-March or April to late October or November (MassNHESP, 2007b). This species overwinters in upland areas covered by leaf litter or woody debris where it typically excavates a burrow or shallow depression as soil temperatures decrease (MassNHESP, 2007b). Mating occurs anytime during the year, but typically happens between April and October (Hunter et al., 1999). Nesting occurs between June and July. Eggs are laid in a variety of open habitats including early successional fields, utility rights-of-way, mulch piles, and abandoned sand or gravel pits (MassNHESP, 2007b). Young turtles emerge shortly before hibernating and sometimes overwinter within the nest site (Hunter et al., 1999).

The MassNHESP has a record of the Eastern box turtle near the I-10 Extension route (French, 2007a; 2007b). The MassNHESP also identified potentially supporting habitat for Eastern box turtles at one location along the I-10 Extension and one location along the Q-1 System Replacement (Marold, 2008a). Algonquin initiated Eastern box turtle surveys and evaluated potential habitat at these locations starting on April 22, 2008. Using the results of this initial survey, Algonquin proposed a refined and more focused Eastern box turtle study area to the MassNHESP on April 30, 2008 (Hyla Ecological Services, Inc., 2008). The MassNHESP reviewed Algonquin's proposal and further revised and finalized the final Eastern box turtle study area on May 2, 2008 (Marold, 2008d). The final survey area included a 4.0-mile-long section along the proposed I-10 Extension ("Survey Area East") and a 4.7-mile-long section along the Q-1 System Replacement ("Survey Area West"). The locations of the final survey areas are listed in table 4.7.3-2.

TABLE 4.7.3-2

Final Box Turtle Survey Areas

Survey Area	Town/City	Pipeline System	Milepost Range	Comments
Survey Area East	Holbrook Randolph Braintree Weymouth	I-10 Extension	3.83-7.83	Includes the I-10 Extension in Holbrook to Summer Street in Weymouth and also includes the Cranberry Brook Watershed ACEC and PH 76/EH 760.
Survey Area West	Sharon Canton	Q-1 System Replacement	12.0-16.7	Includes the Q-1 System Replacement from I-95 to Washington Street in Canton, and also includes the Moose Hill Wildlife Sanctuary and PH 800.

In accordance with the survey protocol and locations agreed to with the MassNHESP, intensive survey sweeps were conducted by a five-person field crew working 6 days a week throughout the month of May 2008. The intensive survey sweeps were continued in June with the crew working 5 days per week. Nesting surveys in suitable habitat within the study corridor were also conducted from June 2 to July 1, 2008 at three separate sections along the pipeline route in Sharon, Holbrook and along the Weymouth/Braintree town line. Eastern box turtles captured during the surveys were fitted with a radio

transmitter and their movements were periodically tracked within the study corridor. During the summer months (July and August), Algonquin reduced the survey effort to one sweep every other week, with continued radio-tracking of all captured turtles.

No Eastern box turtles were found during the intensive survey sweeps, but Algonquin captured and radio tagged four Eastern box turtles during the nesting survey conducted from June 2 to July 1, 2008. Algonquin is currently tracking the movements of these four turtles on a weekly basis until the turtles go into hibernation. No other Eastern box turtles have been found in any of the other survey areas to date.

Algonquin discussed the results of its Eastern box turtle surveys and potential conservation measures with the MassNHESP during the September 12, 2008 meeting, which resulted in a request by the MassNHESP that Algonquin conduct additional visual turtle surveys between September and October of 2008 within the eastern and western survey areas to collect additional data on the Eastern box turtle. Algonquin has stated that it would conduct these additional surveys and include the results of the surveys in its final MESA application.

Based on the September 12, 2008 discussions with the MassNHESP, Algonquin proposes to adopt the following avoidance and minimization measures to protect the Eastern box turtle:

- route the I-10 Extension to parallel and overlap the existing NSTAR powerline right-of-way to limit the amount of new cleared right-of-way and associated forested impacts;
- align the pipeline to deviate from the NSTAR powerline right-of-way to the north between MPs 7.1 and 7.2 to avoid steep slopes and turtle nesting locations at the Holbrook site;
- evaluate whether the proposed contractor staging area at MP 7.1 could be reduced in size or relocated along with the elimination of a segment of access road to avoid direct impacts on turtle nesting habitat and adjacent forested habitat;
- implement preconstruction measures such as radio-tracking to ensure turtles are out of the work area, conduct preconstruction surveys of the construction right-of-way and remove individuals from the work area, and conduct daily turtle sweeps of the Holbrook nesting site during active construction;
- implement construction measures such as continued radio-tracking of tagged turtles to track their locations and any additional turtles that are found to ensure they are out of the construction work area and conducting daily turtle sweeps of the Holbrook site with any active nest site being protected with exclusion fencing; and
- implement post-construction measures including stabilization and restoration of the construction work area in accordance with Algonquin's E&SCP.

Algonquin is continuing its consultations with the MassNHESP and would include the final proposed conservation measures in its final MESA application. Based on Algonquin's implementation of the proposed conservation measures, we conclude that construction of the proposed Project would not have an adverse impact on the Eastern box turtle.

4.7.3.3 Mocha Emerald Dragonfly

The mocha emerald dragonfly is a Massachusetts special concern species. The mocha emerald dragonfly measures approximately 2.3 to 2.7 inches in length depending on the sex of the individual. Both sexes are similar in coloration and body form (MassNHESP, 2007c). The species is found foraging in fields and forest clearings away from its breeding sites between late June and early September (MassNHESP, 2007c). Breeding likely takes place from early July through August in areas consisting of small to medium-sized streams flowing through wooded areas or swamps that contain sandy or fine gravel substrates (MassNHESP, 2007c). The mocha emerald nymph is fully aquatic and remains within the stream system until full development, which generally lasts about 1 year (MassNHESP, 2007c).

The MassNHESP has records of the mocha emerald dragonfly occurring within PH 76/EH 760 (French, 2007a; 2007b) that would be crossed by the I-10 Extension within the Cranberry Brook Watershed ACEC. More specifically, the MassNHESP has identified an area of likely breeding drainages from approximate MPs 5.5 to 6.0. Between these mileposts, the I-10 Extension would cross one intermittent stream (I-19-S1) and four wetlands (W25, W19, W20, and W21).

Algonquin conducted a habitat assessment within this Priority Habitat. One wetland at MP 5.6 (I10-W20) was identified as potential breeding habitat for the mocha emerald dragonfly. Although not a stream, this wetland exhibits seasonal flooding with some stream-like characteristics within the existing powerline corridor as water drains southeast to northwest from Cranberry Pond and associated bog-like wetlands, which are located southeast of the 200-foot-wide study corridor. Although dry at the time of the field survey, the area with stream-like characteristics is approximately 9 feet wide and, based on hydrologic indicators, has an estimated water depth when flowing up to 18 inches. A dense shrub layer exists along the edges of the seasonally flooded area. However, given the intermittent water flow in this wetland, it appears to be unsuitable as breeding habitat for mocha emerald dragonflies as their larvae and/or eggs would likely not be able to withstand the extended dry conditions. Algonquin proposes to construct the crossing of this wetland during the summer months, when it is likely that the wetland would not have standing water at the surface. Given the lack of suitable habitat in this area and timing of construction, Algonquin has determined that construction of the proposed I-10 Extension within PH 76/EH 760 would not have an adverse impact on the mocha emerald dragonfly. Based on the results of the habitat assessment, Algonquin is requesting the MassNHESP's concurrence with the finding of no adverse impact on the mocha emerald dragonfly as part of the final MESA application review. No additional surveys have been required by the MassNHESP.

In a June 3, 2008 correspondence to Algonquin, the MassNHESP stated that the mocha emerald dragonfly could be found in small intermittent streams, but it largely agreed that the proposed Project could be designed to avoid impacts on this species. In this correspondence, the MassNHESP recommended measures to reduce potential impacts on this wetland/waterbody habitat including a dry crossing, careful restoration of the waterbody, invasive species control, and the use of a native seed mix for stabilization and restoration. In addition, during the September 12, 2008 meeting, MassNHESP staff agreed again with Algonquin's assessment assuming Algonquin would implement certain conservation measures. In response to the MassNHESP's recommendations, Algonquin proposes the following construction and post-construction conservation measures:

- use of a dry crossing method (i.e., the flume or dam and pump method to install the pipeline across the waterbody of concern);
- control invasive species by covering segregated topsoil in an effort to limit the proliferation of invasive plant species into the waterbody at the crossing location; and

- segregate topsoil during construction and restore the microtopography and substrate of the waterbody to preconstruction conditions to the extent practicable and through the use of a native seed mix.

Algonquin is currently evaluating the crossing of this area to ensure sufficient conservation measures are in place. Algonquin is continuing its consultations with MassNHESP and would include the final proposed conservation measures in its final MESA application. Based on Algonquin's implementation of conservation measures, we conclude that construction of the proposed Project would not have an adverse impact on the mocha emerald dragonfly and its habitat.

4.7.3.4 Dwarf Rattlesnake Plantain

The dwarf rattlesnake plantain is a state-endangered species in Massachusetts. This species is a native perennial orchid that ranges from 3 to 14 inches tall and is found in coniferous swamps and bogs as well as cool, shady, moist coniferous forests with a mossy component to the understory (USDA, 2008). It may also be found in dry to mesic upland coniferous and mixed forest and dry, cold, and mossy woods, especially under conifers. It prefers cool, acidic, and nutrient poor soils and may occur in full or partial shade. It is considered a late successional or climax species, normally occurring in stands ranging from 95 to 350 years old (USDA, 2008). The dwarf rattlesnake plantain tends to be found in communities with other common associates including paper birch, white pine, quaking aspen, bunchberry, twinflower, prickly rose, mountain cranberry, bluejoint grass, and feathermoss (USDA, 2008). The dwarf rattlesnake plantain flowers in late July to early August and reproduces sexually by seed and vegetatively by rhizomes (USDA, 2008).

Algonquin conducted field surveys during the summer of 2007 along the Q-1 System Replacement route to assess available habitat and to document the presence of this state-endangered plant species. Although some suitable habitat was observed along the Q-1 System Replacement study corridor within the Moose Hill Wildlife Sanctuary, the majority of the property consists of early successional, old field plant communities and mesic to dry upland forest dominated by oaks. No specimens of the dwarf rattlesnake plantain were observed along the existing Q-1 System Replacement right-of-way within the Moose Hill Wildlife Sanctuary. We conclude that no impacts on this plant species would occur.

4.7.3.5 Eastern Pondmussel

The MassNHESP identified the Eastern pondmussel, a Massachusetts special concern species, as occurring within Massapoag Brook that would be crossed by the Q-1 System Replacement in Sharon, Massachusetts at approximate MP 16.2 (Marold, 2008c). The Eastern pondmussel is a medium- to large-sized freshwater mussel that occurs in protected areas of lakes and slackwater areas of rivers and canals. The bivalve prefers stable substrate composed of sand, silty sand, or gravel in slow moving to standing water. The mussel has a distinctive elongate shape and narrow posterior and its periostracum (outer covering) is usually dark brown or blackish. The species is a long-term breeder (i.e., the female carries the eggs for approximately 1 year until they are released as larvae). The larvae parasitically attach to the gills of fish until transforming to juveniles when they drop off to the substrate and continue their adult lives (MassNHESP, 1998).

No surveys for the Eastern pondmussel have been required by the MassNHESP. However, the MassNHESP recommended that Algonquin implement the same protective measures that would be used for trout stream crossings (i.e., a dry crossing method). Originally, Algonquin proposed crossing Massapoag Brook using the wet open-cut method. However, through consultations with the MassNHESP, Algonquin evaluated the crossing location and informed MassNHESP staff during the September 12, 2008 meeting that Massapoag Brook could be constructed using a dry crossing method and

that it would commit to this measure. In addition, the MassNHESP requested that Algonquin conduct preconstruction surveys at the crossing location to identify and relocate, any mussels from the construction work area. Algonquin is continuing its consultations with the MassNHESP on this issue and would include the final proposed conservation measures in its final MESA application. Based on Algonquin's implementation of conservation measures, we conclude that construction of the proposed Project would not have an adverse impact on the Eastern pondmussel and its habitat.

4.7.3.6 Oak Hairstreak Butterfly

The Q-1 System Replacement would cross PH 800, which includes habitat for the oak hairstreak butterfly, a Massachusetts special concern species (French, 2007a; 2007b). Typical habitat within PH 800 includes xeric open oak woodlands and barrens on rocky uplands and sand plains (MassNHESP, 2007d). Adult butterflies feed on the nectar from plant species within weedy or scrub areas within old fields, clearings, and utility rights-of-way (MassNHESP, 2007d). Following mating, eggs are deposited on oak trees; however, the specific species of oak used for egg deposition has not been documented in Massachusetts (MassNHESP, 2007d). Eggs overwinter and hatch in the spring and the larvae pupate by early June (MassNHESP, 2007d).

Algonquin conducted habitat surveys to assess the potential foraging, sheltering, nectaring, and breeding habitats for the oak hairstreak butterfly within PH 800 between approximate MPs 13.0 and 14.1 along the Q-1 System Replacement. It was determined that the best-quality potential oak hairstreak butterfly habitat is located west of Moose Hill Street, where there is a combination of mixed oak forest habitat for foraging, overwintering, and pupating as well as successional field habitat that may provide nectaring for adults on wildflowers. East of Moose Hill Street, the forest is red maple swamp with successional white pine forest and is, therefore, not considered suitable as foraging, overwintering, and/or pupating habitat due to the lack of the necessary oak species.

Within PH 800, the proposed Q-1 System Replacement would be installed using the lift and replace method. Installation of the pipeline would require clearing and disturbance within the existing, maintained Q-1 system and NSTAR rights-of-way as well as minimal clearing (approximately 5 feet) into the woodland edge to the south. No disturbance would occur in the oak woodlands located to the north of the existing powerline right-of-way, which have been identified by the MassNHESP as high quality habitat. Approximately 0.3 acre of oak woodland habitat (i.e., foraging, breeding, and overwintering habitat) located south of the existing Q-1 system right-of-way would be temporarily impacted during construction. In addition, about 1.4 acres of early successional habitat (i.e., nectaring habitat) located within the existing rights-of-way would be impacted. There would be no permanent impacts on oak woodland or nectaring habitat within PH 800. As a result, Algonquin has concluded that construction of the proposed Q-1 System Replacement within PH 800 would not have an adverse impact on the oak hairstreak butterfly. Based on the habitat assessment conducted and the proposed protection measures, Algonquin is requesting the MassNHESP's concurrence with the finding of no adverse impact on this species as part of the final MESA review. No additional surveys have been required by the MassNHESP.

The MassNHESP responded to Algonquin in an e-mail dated June 3, 2008 indicating that it did not agree with certain details of Algonquin's impact assessment. The MassNHESP agreed, however, that with the pipeline being shifted southward, the high quality oak habitat on the north side of the right-of-way would not be affected. As a result, the MassNHESP anticipates a finding of no "take" for the oak hairstreak butterfly.

During the September 12, 2008 meeting, the MassNHESP reiterated that as long as Algonquin does not clear forested habitat to the north of the NSTAR powerline right-of-way, it does not have any concerns with Project impacts and would issue a finding of no "take" for this species. In response, to the

MassNHESP recommendations, Algonquin would avoid the forested habitat to the north of the NSTAR powerline right-of-way. Algonquin would use a native seed mix combined with annual rye grass to stabilize and restore the construction right-of-way within upland areas within PH 800 and would only use annual ryegrass to restore wetland areas. Algonquin has stated that the impact analysis and conservation measures for the oak hairstreak butterfly would be included in its final MESA application. Based on Algonquin's implementation of these conservation measures, we conclude that construction of the proposed Project would not have an adverse impact on the oak hairstreak butterfly and its habitat.

4.7.3.7 Tall-nut Sedge

According to the MassNHESP, the tall-nut sedge, a Massachusetts special concern species, has been documented in Sharon, Massachusetts between Moose Hill and Route 95 just to the west of the PH 800 oak hairstreak butterfly habitat area (Marold, 2008c). Tall-nut sedge is a perennial plant that grows in clustered rhizomes that form hard, tight nodules. The species has a considerable range of suitable open to semi-shaded habitats but tends to be more commonly found in moist, sandy meadows, the margins of marshes and swales, and the borders of oak and pine forests (USDA, 2008). This facultative wetland plant tends to be found in communities with tall beak-rush, twig-rush, pale-spiked lobelia, panic grass, blue jointgrass, chokecherrys, dogwoods, and other facultative plants and facultative wetland forbs and shrubs (USDA, 2008).

Algonquin retained the services of a qualified botanist to conduct a rare plant survey at this location on August 13, 2008 in accordance with a survey protocol approved by the MassNHESP to document whether the tall-nut sedge is present and the extent of any populations that are discovered. No tall-nut sedge plants were identified during the survey, and the final survey report was submitted to the MassNHESP on September 2, 2008. Algonquin then met with the MassNHESP on September 12, 2008 to discuss survey results and conservation measures. Following this meeting, MassNHESP staff conducted an independent site visit in the vicinity of the Project area and found individuals of this plant. However, the MassNHESP has not released the precise location information for these plants to Algonquin so that an assessment of potential impacts can be made. Algonquin has stated that once the locations of the tall-nut sedge plants identified by the MassNHESP are received, it would be able to evaluate the potential impacts. In the event these plants do occur within the proposed construction work area, Algonquin would evaluate three potential conservation measures depending on the exact location of the plants as follows:

- avoidance through implementation of a reroute;
- installation of exclusion fencing to avoid disturbing the plants during active construction; and
- if avoidance is not possible, Algonquin would consider a sod-salvage technique to temporarily remove the plants for storage at a nursery during construction and then replant the population(s) to the original location upon completion of construction. Algonquin proposes to monitor these plants for a 3-year period to evaluate the condition and re-establishment of the population(s).

Algonquin is continuing its consultations with the MassNHESP regarding the tall-nut sedge and would include the impact analysis and final proposed conservation measures in its final MESA application. Until the survey results are available and potential impacts can be addressed, we cannot determine whether the Project would have an adverse impact on the tall-nut sedge.

4.7.4 Summary of Determinations of Effect for Federally and State-listed Species

To comply with section 7 of the ESA, the FERC staff informally consulted with the FWS and NOAA Fisheries regarding the presence of federally listed or proposed species in the Project area. Based on these consultations, it has been determined that the E2W Project would have no effect on federally listed species or their critical habitats. Further consultation or concurrence from the FWS and NOAA Fisheries is not required for "no effect" determinations. Thus, required consultations under section 7 of the ESA are complete unless new species are listed or new information becomes available indicating a potential Project effect on listed species or critical habitat that was not considered in this EIS.

Six Massachusetts special concern species and one state-endangered species potentially occur along the proposed Project in Massachusetts, and no state-listed species were found to occur along the proposed Project in Connecticut. Algonquin conducted botanical and wildlife surveys of the proposed Project facilities to identify the presence of listed species in the Project area during the 2007 field season. Additional surveys were conducted for state-listed species in Massachusetts during 2008 in areas along the pipeline route not surveyed in 2007, as well as for the Eastern box turtle and tall-nut sedge.

Based on the survey results to date and Algonquin's proposed draft conservation measures, we conclude that the Project would have no adverse impacts on any of the state-listed species in Massachusetts with the potential exception of the tall-nut sedge. As discussed in section 4.7.3.7, Algonquin is continuing its consultations with the MassNHESP regarding the tall-nut sedge and would include the impact analysis and final proposed conservation measures in its final MESA application.

Algonquin expects to finalize and submit its MESA application to the MassNHESP in late October 2008. This application would incorporate all field survey results to date, and include an analysis of the potential impacts on state-listed species and a discussion of Algonquin's final proposed conservation measures. To ensure that potential impacts on state-listed species would be avoided or mitigated, **we recommend that:**

- **Algonquin should file its final MESA application, the comments of the MassNHESP on the final MESA application, and any additional consultation and clearance letters with the Secretary <u>during the draft EIS comment period</u>.**

4.7.5 NSTAR Alternative

No federally listed threatened or endangered species or candidate species are known to occur along the NSTAR Alternative (Tur, 2007). In addition, no state-listed threatened or endangered species, candidate species, or special concern species are known to occur along the NSTAR Alternative. Furthermore, no Priority/Estimated Habitats would be crossed by the NSTAR Alternative (MassDFW, 2007).

4.8 LAND USE, RECREATION, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Land Use

Pipeline Facilities

The E2W Project would involve the construction of 31.4 miles of multi-diameter pipeline, including 12.9 miles of new pipeline and 7.5 miles of replacement upgrades of existing pipeline in Norfolk County, Massachusetts, and 11.0 miles of replacement upgrades of existing pipeline in New London County, Connecticut. Of the 12.9 miles of proposed new pipeline, approximately 3.9 miles (30 percent) would be within existing NSTAR right-of-way, 3.8 miles (29 percent) would be outside but adjacent to existing NSTAR right-of-way, and 5.2 miles (41 percent) would be constructed on newly created right-of-way. The entire 7.5 miles (100 percent) of the proposed replacement pipeline in Massachusetts would be constructed within or adjacent to existing rights-of-way owned by NSTAR or Algonquin. Of the 11.0 miles of proposed replacement pipeline in Connecticut, approximately 9.8 miles (89 percent) would be constructed within or adjacent to existing rights-of-way owned by Algonquin, and 1.2 miles (11 percent) would be constructed on newly created right-of-way.

Land use impacts associated with the Project would include the disturbance of existing land uses within the construction right-of-way during construction and retention of an expanded or new permanent right-of-way for operation of the pipelines. Algonquin proposes to generally use a 75- or 85-foot-wide construction right-of-way, consisting of 30 feet of permanent right-of-way and 45 feet of temporary construction workspace in Connecticut, and 50 feet of permanent right-of-way and 35 feet of temporary construction workspace in Massachusetts. In areas on the Q-1 and E-3 System Replacements where the existing pipelines would be upgraded using the lift and replace method, the existing permanent right-of-way width would remain the same (i.e., 50 and 30 feet, respectively). In wetland areas, Algonquin has proposed to use an 85-foot-wide construction right-of-way; however, we are recommending use of a 75-foot-wide construction right-of-way, consistent with our Procedures, unless additional site-specific justifications are provided (see section 4.4.3). In addition to the construction right-of-way, various temporary extra workspaces and access roads would be used for construction.

Table 4.8.1-1 summarizes the acres of each land use type that would be affected by construction and operation of the Project. Construction of Algonquin's proposed pipeline facilities would temporarily affect a total of about 380.9 acres of land, including 274.9 acres for the pipeline right-of-way and 106.0 acres of temporary extra workspace. Open land would be the primary land use affected by construction of the pipelines, totaling about 157.3 acres (41 percent). The remaining land uses that would be disturbed consist of 134.8 acres (35 percent) of forest land, 42.4 acres (11 percent) of commercial/industrial land, 37.3 acres (10 percent) of residential land, 7.8 acres (2 percent) of agricultural land, and 1.3 acres of open water (<1 percent).

Of the 380.9 acres of land that would be affected by construction of the pipeline facilities, about 71.0 acres would be returned to existing permanent right-of-way and 80.8 acres would be retained as new permanent right-of-way. The remaining 229.1 acres used for temporary construction right-of-way and temporary extra workspace would be allowed to revert to prior uses following construction.

TABLE 4.8.1-1

Acres of Land Affected by Construction and Operation of the HubLine/East to West Project

Facility	Agricultural Land [a]	Open Land [b]	Forest Land [c]	Commercial/ Industrial [d]	Residential [e]	Open Water [f]	Total
Pipeline Facilities							
I-10 Extension							
Temporary Construction Impacts	0.0	60.2	66.4	24.0	11.6	1.0	163.3
New Permanent Right-of-Way	0.0	19.5	35.1	10.3	4.3	0.9	70.1
Existing Permanent Right-of-Way	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q-1 System Replacement							
Temporary Construction Impacts	0.0	56.1	15.8	17.7	5.5	0.0	95.1
New Permanent Right-of-Way	0.0	4.6	2.7	0.1	0.0	0.0	7.4
Existing Permanent Right-of-Way	0.0	27.3	1.7	4.2	2.6	0.0	35.8
E-3 System Replacement							
Temporary Construction Impacts	7.8	41.0	52.6	0.8	20.1	0.3	122.6
New Permanent Right-of-Way	0.0	0.7	2.0	0.2	0.2	0.2	3.3
Existing Permanent Right-of-Way	1.1	28.4	1.2	0.0	4.4	<0.1	35.2
Pipeline Facilities Total							
Temporary Construction Impacts	7.8	157.3	134.8	42.4	37.3	1.3	380.9
New Permanent Right-of-Way	0.0	24.8	39.8	10.6	4.5	1.1	80.8
Existing Permanent Right-of-Way	1.1	55.8	2.9	4.2	7.1	<0.1	71.0
Aboveground Facilities							
Rehoboth Compressor Station							
Temporary Construction Impacts	0.0	0.0	16.8	0.0	0.0	0.0	16.8
Permanent Operational Impacts	0.0	0.0	10.3	0.0	0.0	0.0	10.3
I-10 Extension							
Fore River OPP Regulator Station and Pig Launcher							
Temporary Construction Impacts	0.0	1.2	0.0	0.2	0.0	0.0	1.3
Permanent Operational Impacts	0.0	0.7	0.0	0.2	0.0	0.0	0.8
Q-1 System Replacement							
Beginning of Q-1 System OPP Regulator Station and Pig Launcher/Receiver							
Temporary Construction Impacts	0.0	0.6	1.0	0.0	0.0	0.0	1.6
Permanent Operational Impacts	0.0	0.6	0.4	0.0	0.0	0.0	1.0
Sharon OPP Regulator Station							

TABLE 4.8.1-1 (cont'd)

Acres of Land Affected by Construction and Operation of the HubLine/East to West Project

Facility	Agricultural Land [a]	Open Land [b]	Forest Land [c]	Commercial/ Industrial [d]	Residential [e]	Open Water [f]	Total
Temporary Construction Impacts	0.0	0.9	0.0	0.0	0.0	0.0	0.9
Permanent Operational Impacts	0.0	0.6	0.0	0.0	0.0	0.0	0.6
End-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver							
Temporary Construction Impacts	0.0	1.2	1.5	0.0	0.0	0.0	2.7
Permanent Operational Impacts	0.0	0.6	0.6	0.0	0.0	0.0	1.2
E-3 System Replacement							
Beginning of E-3 System Pig Launcher							
Temporary Construction Impacts	0.0	0.3	0.9	<0.1	0.0	0.0	1.3
Permanent Operational Impacts	0.0	0.3	0.1	0.0	0.0	0.0	0.4
End of E-3 System Pig Launcher/Receiver							
Temporary Construction Impacts	0.0	0.1	0.7	0.1	0.0	0.0	0.9
Permanent Operational Impacts	0.0	0.1	0.1	0.0	0.0	0.0	0.2
Mainline Valves, Taps, and Remote Blow-off Valves							
Permanent Operational Impacts	0.0	1.8	0.6	0.0	0.0	0.0	2.4
New Permanent Impacts	0.0	0.3	0.2	.0.0	0.0	0.0	0.5
Aboveground Facilities Total							
Permanent Operational Impacts	0.0	6.1	21.5	0.3	0.0	0.0	27.9
New Permanent Impacts	0.0	3.2	11.8	0.2	0.0	0.0	15.1
Pipe Storage and Contractor Ware Yards							
I-10 Extension	0.0	0.0	0.0	27.4	0.0	0.0	27.4
Q-1 System Replacement	0.0	0.0	0.0	36.0	0.0	0.0	36.0
E-3 System Replacement	0.0	5.9	0.0	0.0	0.0	0.0	5.9
Pipe Storage and Contractor Ware Yards Total	0.0	5.9	0.0	63.4	0.0	0.0	69.3
Access Roads							
I-10 Extension							
Temporary Access Roads	0.0	0.7	0.4	2.0	0.6	0.0	3.6
Permanent Access Roads	0.0	0.0	0.1	1.3	0.0	0.0	1.4
Q-1 System Replacement							
Temporary Access Roads	0.0	1.8	0.3	0.2	0.0	0.0	2.5

TABLE 4.8.1-1 (cont'd)

Acres of Land Affected by Construction and Operation of the HubLine/East to West Project

Facility	Agricultural Land [a]	Open Land [b]	Forest Land [c]	Commercial/ Industrial [d]	Residential [e]	Open Water [f]	Total
Permanent Access Roads	0.0	0.2	0.7	0.4	0.0	0.0	1.2
E-3 System Replacement							
Temporary Access Roads	0.5	0.0	<0.1	1.7	0.7	0.0	2.8
Permanent Access Roads	0.0	0.0	0.0	0.0	1.2	0.0	1.2
Rehoboth Compressor Station							
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	1.3	0.0	0.0	0.0	1.3
Access Roads Total							
Temporary Access Roads	0.5	2.5	0.8	3.9	1.3	0.0	8.9
Permanent Access Roads	0.0	0.2	2.0	1.7	1.2	0.0	5.1
Project Total							
Temporary Construction Impacts	8.3	172.0	159.1	111.7	39.7	1.3	492.1
Permanent Operational Impacts	1.1	83.9	56.6	16.6	12.8	1.1	172.0

[a] Agricultural land includes cultivated lands and active hayfields.
[b] Open land includes upland herbaceous and scrub-shrub areas, as well as non-forested wetlands.
[c] Forest land includes areas of upland deciduous, evergreen, and mixed forest, as well as forested wetlands.
[d] Commercial/Industrial land includes commercial land and transportation, communications, and utility rights-of-way not currently used for other purposes.
[e] Residential land includes areas where numerous homes exist within close proximity and consists of lawns, driveways, and landscaped areas.
[f] Open water includes major waterbody (>100 feet wide) crossings. The major waterbodies that would be crossed are the Weymouth Fore and Shetucket Rivers. These waterbodies would be crossed using the HDD method.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

The permanent right-of-way would be 50 feet wide along the I-10 Extension and Q-1 System Replacement and 30 feet wide along the E-3 System Replacement. The land retained as permanent right-of-way would generally be allowed to revert to former use; however, certain activities such as the construction of aboveground structures, including houses, house additions, garages, patios, pools, or other objects not easily removable, or the planting of trees, would be prohibited within the permanent right-of-way. To facilitate pipeline inspection, operation, and maintenance, the entire permanent right-of-way in upland areas would be cleared of woody vegetation and maintained in an herbaceous/scrub-shrub vegetated state. This maintained right-of-way would be mowed no more than once every 3 years. Additionally, to facilitate corrosion surveys, a 10-foot-wide strip centered over the pipeline would be mowed annually. Algonquin would not use herbicides for general maintenance of the right-of-way.

Impacts on agricultural, open, forested, and commercial/industrial areas are discussed below. Impacts on residential areas are discussed in section 4.8.3.1. Wetlands and surface waters are discussed in sections 4.4 and 4.3.2, respectively. Impacts on transportation uses are discussed in section 4.9.4.

Agricultural Land – No agricultural land would be crossed by the 1-10 Extension. The Q-1 System Replacement pipeline facilities would cross about 0.1 mile of agricultural land, and the E-3 System Replacement pipeline facilities would cross about 0.3 mile of agricultural land. About 7.8 acres of agricultural land would be affected by the pipeline facilities and temporary extra workspace.

Construction on agricultural land would be conducted as described in section 2.3.1. The effects of construction on agricultural land are expected to be minor and short term. Short-term impacts on agricultural areas would include the loss of standing or row crops within the construction work area and the disruption of farming operations for the growing season during the year of construction. To reduce these impacts, Algonquin would adhere to the measures outlined in its E&SCP (see Appendix F) for agricultural areas. These measures include testing the topsoil and subsoil for compaction at regular intervals in areas disturbed by construction activities and strictly controlling equipment traffic on agricultural land to minimize compaction and rutting. To preserve soil fertility in agricultural land, the entire topsoil layer (to a maximum depth of 12 inches) would be stripped from either the pipeline trench and subsoil storage area or the full construction right-of-way, as stipulated in landowner agreements, and stored separately from the subsoil. After backfilling the trench, Algonquin would replace the topsoil as the final surficial layer and test for compaction. If necessary, the topsoil layer would be remediated for bulk density and excess rock would be removed. Algonquin would also attempt to identify the location of drain tiles or irrigation systems prior to construction and would repair or replace any drain tiles or irrigation systems damaged by construction activities.

Following construction, Algonquin would implement the restoration practices outlined in its E&SCP. Operation of the permanent pipeline right-of-way would occur on 1.1 acres of agricultural land, all of which would be on existing permanent right-of-way. Agricultural uses would continue as before construction. Algonquin would monitor crops during the first growing season and, if necessary, the second growing season to determine if additional restoration is needed. Algonquin would address compensation for crop damage or production loss associated with construction and operation with each individual landowner.

Open Land – The I-10 Extension would cross about 3.8 miles of open land, the Q-1 System Replacement would cross about 5.7 miles of open land, and the E-3 System Replacement would cross about 8.3 miles of open land. Approximately 157.3 acres of open land would be affected by the pipeline facilities and temporary extra workspace.

The majority of the open land that would be impacted by the E2W Project is associated with either Algonquin's existing right-of-way or other utility rights-of-way currently maintained as open land.

Construction-related impacts on open land would include the removal of vegetation and disturbance of the soils. These impacts would be temporary and short term and would be minimized by implementation of Algonquin's E&SCP. Following construction, most open land uses would be able to continue. However, some activities, such as the building of new commercial or residential structures, would be prohibited on the permanent right-of-way. Operation of the pipeline facilities would occur on 80.6 acres of open land, 55.8 acres of which is existing permanent right-of-way.

Forest Land – The I-10 Extension would cross about 5.4 miles of forest land, the Q-1 System Replacement would cross about 0.4 mile of forest land, and the E-3 System Replacement would cross about 0.8 mile of forest land. Approximately 134.8 acres of forest land would be affected by the pipeline facilities and temporary extra workspace.

Forest land affected by the Project consists mainly of the central hardwood-hemlock-white pine forest type. Algonquin would minimize forest land impacts by locating the proposed facilities within existing rights-of-way and open land wherever possible. Construction of the pipeline facilities in forested areas would require the removal of trees to prepare the construction work areas. Although trees cleared within temporary construction work areas would be allowed to regenerate to preconstruction conditions following construction, impacts on forest resources within these areas would last for several years (see section 4.5.2).

Following construction, permanent impacts would occur over the maintained portion of the right-of-way. As discussed in section 4.5.2, a 10-foot-wide area centered over the pipeline would be maintained treeless on an annual basis. In addition, the clearing of Algonquin's permanent easement every 3 years would prevent forest overstory vegetation within that area from attaining a mature size and thus would permanently alter the nature of the affected forest land. In total, about 42.7 acres of forest land would be removed for operation of the pipeline, 2.9 acres of which is within existing permanent right-of-way.

Commercial/Industrial Land – The I-10 Extension would cross about 2.1 miles of commercial/ industrial land, the Q-1 System Replacement would cross about 0.7 mile of commercial/industrial land, and the E-3 System Replacement would cross about 0.1 mile of commercial/industrial land. Approximately 42.4 acres of commercial/industrial land would be affected by the pipeline facilities and temporary extra workspace.

Commercial/industrial land uses could be temporarily impacted during pipeline construction by increased dust from exposed soils, construction noise, and traffic congestion. Algonquin would minimize impacts on commercial land uses by coordinating driveway crossings with business owners to provide access across the construction right-of-way. Algonquin would keep materials available onsite to create a temporary platform across the pipeline trench if the need arises. Road surfaces would be restored as soon as practicable so that normal access can resume, and commercial land uses would be restored to preconstruction conditions, or as specified in landowner agreements.

The E2W Project would cross 47 paved roadways and 5 railroads in Massachusetts and 20 paved roadways and 1 railroad in Connecticut. These roadways would be crossed using conventional road bore methods or would be open cut, depending on specific permit conditions, as described in section 2.3.2. The railroads would be crossed using the bore method. Additionally, a roadway and railroad crossing would be encompassed in the HDD crossing of the Weymouth Fore River. HDD and bore crossing methods allow the roadway or railroad to remain in service while the installation process takes place. As a result, there would be little or no disruption to traffic at roadway or railroad crossings that are crossed by HDD or bore. In the event of an open-cut crossing, impacts on roadways would include short-term traffic congestion and disruption. To minimize these impacts, Algonquin would implement appropriate

traffic control measures to maintain traffic flow and adhere to all applicable DOT, state, and local regulations to ensure safe driving conditions.

Following construction, roadways would be restored to preconstruction conditions. Operation of the pipeline facilities would occur on 14.8 acres of commercial/industrial land, 4.2 acres of which is within existing permanent right-of-way.

Residential Land – The I-10 Extension would cross about 0.9 mile of residential land, the Q-1 System Replacement would cross about 0.5 mile of residential land, and the E-3 System Replacement would cross about 1.4 miles of residential land. Approximately 37.3 acres of residential land would be affected during construction of the pipeline facilities. Operation of the pipeline facilities would impact 11.6 acres of residential land, 7.1 acres of which is within existing permanent right-of-way.

Similar to commercial/industrial lands, residential land could be temporarily impacted during pipeline construction by increased dust from exposed soils, construction noise, and traffic congestion. Algonquin would construct through or near residential areas in a manner to ensure that construction activities minimize adverse impacts on residences and that cleanup is prompt and thorough. The location of existing residences and structures within 50 feet of the construction work area, and the impacts on and mitigation proposed for these residences and structures, are discussed in section 4.8.3.1.

Open Water – The I-10 Extension would cross about 0.7 mile of open water and the E-3 System Replacement would cross about 0.2 mile of open water. The Q-1 System Replacement would not cross open water.

Open water impacts associated with the Project include the Weymouth Fore River at MP 0.3 of the I-10 Extension and the Shetucket River at MP 3.6 of the E-3 System Replacement. Both of these waterbodies would be avoided by the HDD method and, therefore, no construction or permanent impacts would occur. A detailed discussion of the surface waters affected by the Project is provided in section 4.3.2.

Aboveground Facilities

As discussed in section 2.1.2 and listed in table 2.1.2-1, Algonquin proposes to construct one new compressor station and install aboveground OPP regulator stations at four locations along its right-of-way in Massachusetts, two of which would be located at existing meter stations. Algonquin also proposes to install pig launcher/receiver facilities and mainline valves, taps, and remote blow-off valves along the pipeline routes and modify three existing compressor stations in Rhode Island, Connecticut, and New Jersey to accommodate bidirectional flow.

Construction activities at existing aboveground facilities would occur within the existing buildings or on previously disturbed, graded, or graveled areas within the existing fenceline of the facilities. No additional land would be required or disturbed during the modification or operation of these facilities, thus, they will not be discussed further in this section.

Table 4.8.1-1 summarizes the land requirements and land use for the aboveground facilities associated with the E2W Project. Approximately 18.1 acres of forest land would be required during construction of the Rehoboth Compressor Station, associated facilities, and access road. Of the 18.1 acres required for construction, approximately 11.6 acres would be permanently retained for operation of the facility. Algonquin is considering acquiring a 97.0-acre parcel of land for siting the Rehoboth Compressor Station. The compressor station itself would be secured with chain link fencing but Algonquin does not anticipate fencing the remainder of the 97.0-acre parcel. In addition, Algonquin does

not plan to develop the remaining 85.4 acres of the property, and the property would not be available for outside development. Although Algonquin's primary intent is to preserve the 85.4 acres as screening and buffering for the proposed compressor station, portions of the parcel could possibly be used as potential conservation or mitigation areas. As discussed in section 4.5.2, the majority of the 97-acre property Algonquin proposes to acquire for the site is forest land. The proposed Rehoboth Compressor Station site is currently zoned for residential development. The Town of Rehoboth has not expressed concern about the residentially zoned property being used for the proposed compressor station.

A total of approximately 11.1 acres of land would be required for construction of other aboveground facilities, 4.8 acres of which would be permanently retained for operation of the facilities. The dominant land uses that would be affected by these facilities are forest land and open land.

Abandoned Facilities

Approximately 2.4 miles of pipeline would be abandoned in place at various highway, railroad, and waterbody crossings, as well as areas where Algonquin has determined that removal of the existing pipeline would create unsafe conditions or have adverse environmental impacts. In areas along the Q-1 and E-3 System Replacements where the existing pipeline would be abandoned in place, the abandonment activities would occur within the proposed construction right-of-way and would not require any additional land. Additional discussion of abandoned facilities is provided in section 2.2.1.4.

Algonquin has stated that it would abandon pipelines according to the terms of the existing easement agreements. If an existing easement agreement does not address abandonment, Algonquin would negotiate with landowners regarding appropriate terms for abandonment. Algonquin has also stated that it would retain or amend its existing easement rights in areas where the pipeline is abandoned. In situations where Algonquin determines to abandon the pipeline by removal, it would determine whether to release the existing easement or modify the easement. We do not believe Algonquin has been clear as to the final disposition of easements along the sections of pipeline that would be abandoned. It is the Commission's practice that all landowners are provided the opportunity to request that abandoned pipelines be removed and that pipeline companies relinquish all surface rights back to the landowners for easements in which there are no longer in-service pipelines in the right-of-way. We will seek clarification on this issue during the draft EIS comment period.

Pipe Storage and Contractor Ware Yards

Algonquin proposes to use six pipe storage and contractor ware yards on a temporary basis to support construction activities. These yards would temporarily affect about 69.3 acres of land, consisting of approximately 63.4 acres of commercial/industrial land and 5.9 acres of open land (see table 4.1.8-1).

Access Roads

Algonquin proposes to use 42 access roads during construction, of which 38 are existing roads as discussed in section 2.2.4 and listed in table 2.2.4-1. In Massachusetts, 16 access roads would be used along the I-10 Extension and 10 roads would be used along the Q-1 System Replacement. In Connecticut, 15 access roads would be used along the E-3 System Replacement. Algonquin would also construct three new roads along the Q-1 System Replacement and one permanent paved access road to the Rehoboth Compressor Station. The temporary access roads would affect about 6.1 acres of land in Massachusetts and 2.8 acres of land in Connecticut during construction (see table 4.8.1-1). The permanent access roads would affect about 3.9 acres of land in Massachusetts and 1.2 acres of land in Connecticut (see table 4.8.1-2).

Algonquin proposes to maintain 13 access roads for permanent operation and maintenance use following construction as listed in table 4.8.1-2. Six of the roads are existing and would require modifications. The other roads are new (four) or would not require modifications (three). For roads requiring modifications, the surface of existing temporary access roads would not be changed; however, improvements (e.g., grading, trimming overhanging vegetation, replacing/installing culverts) may be required based on the equipment that would utilize the road. In Massachusetts, nine permanent access roads would be utilized, including three along the I-10 Extension, four along the Q-1 System Replacement, and one for access to the Rehoboth Compressor Station. In Connecticut, four permanent access roads would be utilized along the E-3 System Replacement. The width of these access roads would generally be 20 feet as shown in table 4.8.1-2.

TABLE 4.8.1-2

Permanent Access Roads Associated with the HubLine/East to West Project

State/Facility/ Access Road Name	Required Construction (type)	Length (feet)	Width (feet)	Permanent Impacts (acres)	Land Use
Massachusetts					
I-10 Extension					
PAR 0.00	Improvement/Existing Road	+/-750	20	0.0	Existing Gravel Road
PAR 1.30	Improvement/Existing Road	+/-160	20	0.1	Existing Dirt Road
PAR 7.20	Improvement/Existing Road	+/-2900	20	1.3	Existing Paved/Dirt Road
Q-1 System Replacement					
PAR 12.24	New Road	+/-860	20	0.4	Upland Forest/Woodland and Open Land
PAR 15.62	Improvement/Existing Road	+/-640	20	0.3	Existing Gravel Road
PAR 18.50	New Road	+/-330	20	0.2	Upland Forest/Woodland
PAR 19.59	New Road	+/-860	20	0.4	Industrial/Commercial and Upland Forest/Woodland
Rehoboth Compressor Station	New Road	+/-2,850	20	1.3	Upland Forest/ Woodland
Connecticut					
E-3 System Replacement					
PAR 0.00	Improvement/Existing Road	+/-1,600	20	0.0	Existing Dirt/Gravel Road
PAR 0.01	Improvement/Existing Road	+/-430	20	0.2	Existing Dirt Road
PAR 1.88	None	+/-300	20	0.1	Existing Paved Road
PAR 2.90	None	+/-1900	20	0.9	Existing Paved Road
PAR 11.00	None	+/-1,100	20	0.0	Existing Gravel Road
Project Total				5.1	

Temporary Extra Workspace

As discussed in section 2.2.1.3, Algonquin has identified certain areas where it believes site-specific conditions require the use of temporary extra workspace outside of the proposed nominal 85-foot-wide construction right-of-way along the I-10 Extension and Q-1 System Replacement and the nominal 75-foot-wide construction right-of-way along the E-3 Replacement System. Table E-1 in Appendix E

lists the locations of these temporary extra workspaces and their dimensions. Table E-1 also lists the acreage of impact, the land use, the reasons why Algonquin believes the additional workspace is justified, and our decision to approve or deny Algonquin's request. Based on our review, the majority of Algonquin's requests appear justified. However, we cannot approve Algonquin's requests at the following locations without submittal of additional justification for, or modification of, the following workspaces:

- near MPs 0.0, 0.01, 3.93, 4.25, 4.40, 4.86, 5.22, 7.02, 10.88, and 11.42 of the I-10 Extension, we cannot approve the use of these workspaces unless their configurations are modified to reduce the size/layout of the workspace or to increase the setback from wetlands and waterbodies. If this is infeasible, Algonquin should provide additional justification as to why workspace modifications are not possible;

- near MP 1.29 along the I-10 Extension, we cannot approve the workspace associated with the proposed blow-off valve site pending the results of an alternative site analysis (see section 3.6.2);

- near MP 3.16 of the I-10 Extension, we cannot approve the use of this workspace without additional justification for the approximate 90-foot by 40-foot portion of the workspace that would clear forested vegetation for access by TAR 3.14;

- near MPs 3.82 and 6.41 along the I-10 Extension and MPs 2.08 and 7.14 along the E-3 System Replacement, we cannot approve the use of these workspaces unless their configurations are modified to maintain visual screening;

- near MPs 7.64 and 8.93 along the I-10 Extension, we cannot approve the use of these workspaces unless their configurations are modified to avoid clearing vegetative screening between residential areas and the existing NSTAR right-of-way;

- near MP 7.79 along the I-10 Extension, we cannot approve the use of this workspace unless it is reconfigured to provide a buffer between Sylvan Lake and the workspace;

- near MPs 8.40, 11.44, 11.76, 11.85, 12.20, 12.50, and 12.76 along the I-10 Extension and MP 7.14 along the E-3 System Replacement, we cannot approve the use of these workspaces without submittal of site-specific requests and appropriate justification for workspace regarding wetlands and waterbodies as well as additional justification for use of the workspaces (i.e., rock storage);

- near MPs 10.19, 11.23, and 11.45 along the I-10 Extension; MPs 13.62, 13.77, 16.87, 17.17, and 17.43 along the Q-1 System Replacement; and MPs 4.06, 4.84, 5.24, and 8.19 along the E-3 System Replacement, we cannot approve the use of these workspaces without the submittal of site-specific requests and appropriate justification;

- near MPs 11.45, 11.76, 11.85, 12.20, and 12.38 along the I-10 Extension, we cannot approve the use of these workspaces without additional justification because these workspaces are requested for additional rock storage, but these areas are not included in areas identified by Algonquin that may require blasting;

- near MP 3.30 of the E-3 System Replacement, we cannot approve the use of this workspace because the current alignment sheets do not show the extent of the proposed staging/laydown area adjacent to the Shetucket River; and

- near MP 3.35 along the E-3 System Replacement, we cannot approve the use of this workspace. Although a request was made for the use of workspace within 50 feet of wetlands and waterbodies, additional justification is needed for the use of this workspace independent of wetland and waterbody resources.

Algonquin's alignment sheets also depict six temporary extra workspaces near MPs 1.37, 1.48, 2.76, 5.22, 7.42, and 7.64 along the proposed I-10 Extension; however, Algonquin did not include these areas in its table of requested temporary extra workspaces.

All of these extra workspaces are listed in table E-1 in Appendix E as requiring additional justification or pending a site-specific request and justification. If Algonquin determines that the use of these extra workspaces is necessary, **we recommend that:**

- **Algonquin should file a site-specific request and justification for each unapproved extra workspace listed in table E-1 in Appendix E with the Secretary <u>during the draft EIS comment period</u>.**

4.8.2 Land Ownership and Easement Requirements

Pipeline operators must obtain easements from existing landowners to construct and operate proposed facilities, or acquire the land on which the facilities would be located. Easements can be temporary, granting the operator the use of the land during project construction (e.g., temporary extra workspaces, temporary access roads, contractor yards), or permanent, granting the operator the right to operate and maintain the facilities once constructed.

Algonquin's existing permanent easements associated with the E-3 system and Q-1 system pipelines gives it the right to maintain the right-of-way as necessary for pipeline operation, including the removal of larger vegetation and trees, as needed. Because 84 percent of the proposed Q-1 System Replacement and 89 percent of the proposed E-3 System Replacement would be located within Algonquin's existing right-of-way, Algonquin would not need to acquire new easements or property to operate the proposed facilities in these areas. However, in the areas where the proposed Q-1 and E-3 System Replacements deviate from Algonquin's existing right-of-way, Algonquin would need to acquire new temporary and permanent easements.

Algonquin would need to acquire new easements or acquire the necessary land to construct and operate the proposed I-10 Extension. The easements would convey both temporary (for construction) and permanent rights-of-way to Algonquin and would give Algonquin the right to construct, operate, and maintain the pipeline and related facilities.

An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction. Compensation would be based on a market study conducted by a licensed real estate appraiser.

If an easement cannot be negotiated with a landowner and the E2W Project is certificated by the FERC, Algonquin may use the right of eminent domain granted to it under section 7(h) of the NGA and the procedures set forth under the Federal Rules of Civic Procedure (Rule 71A) to obtain the right-of-way and temporary extra workspace areas necessary to construct and operate the Project. Algonquin would still be required to compensate the landowner for the right-of-way and damages incurred during construction. However, the level of compensation would be determined by a court according to state or

federal law. In either case of a negotiated easement or right-of-way obtained via eminent domain, Algonquin would compensate landowners for use of the land. Eminent domain does not apply to lands under federal or tribal ownership but does apply to lands under state and local ownership.

The modifications to existing aboveground facilities would occur on private lands owned by Algonquin. No additional easements would be required for these facilities. As previously discussed, Algonquin is considering the acquisition of a 97.0-acre site for the proposed Rehoboth Compressor Station site. If Algonquin acquires the encompassing land parcels for the property, no easements would be required for construction or operation of the facility.

4.8.3 Existing Residences, Commercial Facilities, and Planned Developments

4.8.3.1 Existing Residences and Commercial Facilities

Table 4.8.3-1 lists residences and other structures within 50 feet of the construction work area (i.e., construction right-of-way and temporary extra workspace) by milepost, and indicates the distance and orientation of each from the proposed work area. Algonquin's proposed construction work area would be located within 50 feet of 176 residential, commercial, or other structures (e.g., garages). A total of 78 residences would be within 25 feet of the construction work area. Of the 78 residences within 25 feet of the construction work area, 23 are located on the I-10 Extension, 22 are located on the Q-1 System Replacement, and 33 are located on the E-3 System Replacement. Of the remaining 49 residences within 50 feet of the construction work area, 25 are located on the I-10 Extension, 6 are located on the Q-1 System Replacement, and 18 are located on the E-3 System Replacement. No residences have been identified within 50 feet of the Rehoboth Compressor Station site or the three existing compressor stations that would be modified.

The 176 residential or other structures within 50 feet of the construction work area would be most likely to experience the effects of construction and operation of the Project. In general, as the distance to the construction work area increases, the impacts on residences decrease. In residential areas, the two most significant impacts associated with construction and operation of a pipeline are temporary disturbances during construction and the encumbrance of the permanent right-of-way, which would prevent the construction of permanent structures within the right-of-way.

Temporary construction impacts on residential areas could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or driveways; ground disturbance of lawns; removal of trees, landscaped shrubs, or other vegetative screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells; and removal of aboveground structures such as fences, sheds, or trailers from within the right-of-way. Before mobilizing any equipment, Algonquin would stake the limits of disturbance and the centerline of the pipeline. Affected landowners would be notified at least 3 to 5 days before construction commences, unless more advance notice is requested by the landowner during easement negotiations.

If the construction right-of-way crosses a road, Algonquin would maintain access so residents have ingress/egress to their homes and workers and customers have access to businesses. If the road is open cut, one lane would remain open during construction or traffic would be detoured around the work area through the use of adjacent roadways. Traffic safety personnel would be present during construction periods, and signage and safety measures would be developed in compliance with applicable state and local roadway crossing permits. To the maximum extent practicable, Algonquin would schedule work within roadways to avoid commuter traffic and impacts on school bus schedules.

TABLE 4.8.3-1

Residences and Other Structures Within 50 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/ Town	County, State	MP	Description of Structure	Approximate Distance from Construction Work Area (feet)	Approximate Distance and Direction from Pipeline Centerline (feet)
Massachusetts					
I-10 Extension					
Weymouth	Norfolk, MA	0.0	Commercial	17	232, Left
Weymouth	Norfolk, MA	0.0	Residential	44	314, Left
Weymouth	Norfolk, MA	0.0	Residential	41	401, Left
Weymouth	Norfolk, MA	1.29	Garage	35	189, Left
Weymouth	Norfolk, MA	1.58	Residential	32	90, Left
Weymouth	Norfolk, MA	1.63	Residential	47	82, Left
Weymouth	Norfolk, MA	1.69	Commercial	50	100, Right
Weymouth	Norfolk, MA	1.71	Residential	13	88, Right
Weymouth	Norfolk, MA	1.75	Residential	13	89, Right
Weymouth	Norfolk, MA	1.81	Residential	12	90, Right
Weymouth	Norfolk, MA	2.37	Commercial	2	12, Left
Weymouth	Norfolk, MA	2.4	Commercial	4	17, Left
Weymouth	Norfolk, MA	2.46	Commercial	14	155, Left
Weymouth	Norfolk, MA	2.81	Commercial	40	75, Left
Weymouth	Norfolk, MA	2.87	Residential	10	99, Right
Weymouth	Norfolk, MA	2.88	Commercial	35	70, Left
Weymouth	Norfolk, MA	2.88	Commercial	37	72, Left
Weymouth	Norfolk, MA	2.89	Commercial	30	65, Left
Weymouth	Norfolk, MA	2.91	Residential	38	126, Right
Weymouth	Norfolk, MA	2.96	Residential	19	181, Right
Weymouth	Norfolk, MA	2.97	Garage	34	196, Right
Holbrook	Norfolk, MA	6.42	Residential	2	70, Left
Holbrook	Norfolk, MA	6.48	Residential	9	59, Right
Holbrook	Norfolk, MA	6.7	Garage	22	94, Right
Holbrook	Norfolk, MA	6.77	Commercial	13	69, Right
Holbrook	Norfolk, MA	7.66	Residential	12	111, Right
Holbrook	Norfolk, MA	7.72	Residential	49	160, Right
Holbrook	Norfolk, MA	7.78	Residential	20	83, Right
Randolph	Norfolk, MA	7.86	Commercial	39	124, Right
Randolph	Norfolk, MA	7.87	Commercial	34	106, Right
Randolph	Norfolk, MA	7.92	Residential	39	137, Right
Randolph	Norfolk, MA	7.93	Residential	44	179, Right
Randolph	Norfolk, MA	7.96	Residential	41	123, Right
Randolph	Norfolk, MA	7.99	Residential	22	43, Right
Randolph	Norfolk, MA	7.99	Garage	24	44, Right
Randolph	Norfolk, MA	7.99	Residential	15	37, Right
Randolph	Norfolk, MA	8.01	Residential	28	121, Left
Randolph	Norfolk, MA	8.09	Residential	23	76, Left
Randolph	Norfolk, MA	8.11	Garage	36	125, Right
Randolph	Norfolk, MA	8.12	Garage	8	105, Right
Randolph	Norfolk, MA	8.13	Residential	5	107, Right
Randolph	Norfolk, MA	8.13	Residential	15	96, Left

TABLE 4.8.3-1 (cont'd)

Residences and Other Structures Within 50 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/ Town	County, State	MP	Description of Structure	Approximate Distance from Construction Work Area (feet)	Approximate Distance and Direction from Pipeline Centerline (feet)
Randolph	Norfolk, MA	8.16	Residential	19	86, Left
Randolph	Norfolk, MA	8.16	Residential	39	94, Right
Randolph	Norfolk, MA	8.19	Residential	37	93, Right
Randolph	Norfolk, MA	8.23	Residential	15	49, Right
Randolph	Norfolk, MA	8.39	Residential	11	84, Right
Randolph	Norfolk, MA	8.42	Residential	15	57, Right
Randolph	Norfolk, MA	8.43	Residential	49	115, Left
Randolph	Norfolk, MA	8.51	Residential	30	149, Right
Randolph	Norfolk, MA	8.89	Commercial	22	84, Right
Randolph	Norfolk, MA	8.94	Residential	8	71, Left
Randolph	Norfolk, MA	9	Residential	41	93, Left
Randolph	Norfolk, MA	9.04	Residential	37	72, Left
Randolph	Norfolk, MA	9.04	Residential	20	70, Right
Randolph	Norfolk, MA	9.06	Residential	32	82, Right
Randolph	Norfolk, MA	9.07	Residential	48	98, Right
Randolph	Norfolk, MA	9.1	Residential	46	79, Left
Randolph	Norfolk, MA	9.29	Residential	27	78, Right
Randolph	Norfolk, MA	9.31	Residential	19	69, Right
Randolph	Norfolk, MA	9.33	Residential	44	79, Left
Randolph	Norfolk, MA	9.33	Residential	42	92, Right
Randolph	Norfolk, MA	9.35	Residential	22	88, Right
Randolph	Norfolk, MA	9.35	Residential	42	77, Left
Randolph	Norfolk, MA	9.39	Residential	36	110, Left
Stoughton	Norfolk, MA	10.05	Commercial	34	84, Right
Stoughton	Norfolk, MA	10.34	Commercial	22	46, Right
Stoughton	Norfolk, MA	10.56	Commercial	17	52, Left
Stoughton	Norfolk, MA	10.59	Commercial	10	36, Right
Stoughton	Norfolk, MA	10.63	Commercial	8	58, Left
Stoughton	Norfolk, MA	10.63	Commercial	5	47, Right
Canton	Norfolk, MA	12.36	Residential	22	61, Left
Canton	Norfolk, MA	12.39	Residential	44	101, Left
Q-1 System Replacement					
Sharon	Norfolk, MA	14.56	Residential	29	64, Right
Sharon	Norfolk, MA	15.41	Garage	10	37, Right
Sharon	Norfolk, MA	15.43	Residential	18	53, Right
Canton	Norfolk, MA	16.66	Commercial	20	55, Right
Canton	Norfolk, MA	16.66	Commercial	0	50, Left
Canton	Norfolk, MA	16.78	Commercial	1	53, Right
Canton	Norfolk, MA	16.79	Commercial	4	54, Left
Canton	Norfolk, MA	16.79	Commercial	18	53, Right
Canton	Norfolk, MA	16.89	Commercial	9	98, Right
Stoughton	Norfolk, MA	17.31	Residential	42	77, Right
Stoughton	Norfolk, MA	17.31	Residential	2	36, Right
Stoughton	Norfolk, MA	17.32	Residential	6	23, Right
Stoughton	Norfolk, MA	17.33	Residential	10	30, Right
Stoughton	Norfolk, MA	17.35	Residential	7	27, Right
Stoughton	Norfolk, MA	17.37	Residential	20	40, Right
Stoughton	Norfolk, MA	17.39	Residential	11	31, Right
Stoughton	Norfolk, MA	17.42	Residential	11	31, Right

TABLE 4.8.3-1 (cont'd)

Residences and Other Structures Within 50 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/ Town	County, State	MP	Description of Structure	Approximate Distance from Construction Work Area (feet)	Approximate Distance and Direction from Pipeline Centerline (feet)
Stoughton	Norfolk, MA	17.46	Residential	8	28, Right
Stoughton	Norfolk, MA	17.51	Residential	10	30, Right
Stoughton	Norfolk, MA	17.53	Residential	11	31, Right
Stoughton	Norfolk, MA	17.55	Residential	8	28, Right
Stoughton	Norfolk, MA	17.59	Residential	2	37, Right
Canton	Norfolk, MA	17.7	Commercial	33	174, Left
Canton	Norfolk, MA	17.81	Commercial	2	24, Right
Canton	Norfolk, MA	18.03	Commercial	36	106, Left
Canton	Norfolk, MA	18.08	Commercial	21	73, Left
Canton	Norfolk, MA	18.14	Commercial	42	111, Left
Canton	Norfolk, MA	18.21	Commercial	24	74, Left
Canton	Norfolk, MA	18.28	Residential	8	28, Left
Canton	Norfolk, MA	18.28	Residential	39	74, Right
Canton	Norfolk, MA	18.31	Residential	13	33, Left
Canton	Norfolk, MA	18.32	Residential	31	66, Right
Canton	Norfolk, MA	18.32	Residential	32	52, Left
Canton	Norfolk, MA	18.36	Residential	0	19, Left
Canton	Norfolk, MA	18.38	Residential	6	26, Left
Canton	Norfolk, MA	18.39	Residential	23	43, Left
Canton	Norfolk, MA	18.42	Residential	4	32, Left
Canton	Norfolk, MA	18.43	Residential	30	80, Left
Canton	Norfolk, MA	18.44	Garage	27	62, Right
Canton	Norfolk, MA	18.45	Residential	10	45, Right
Canton	Norfolk, MA	18.46	Garage	3	53, Left
Canton	Norfolk, MA	18.47	Residential	5	32, Left
Canton	Norfolk, MA	18.49	Residential	5	33, Left
Canton	Norfolk, MA	18.73	Commercial	11	46, Right
Canton	Norfolk, MA	19.47	Commercial	0	32, Right
Connecticut					
E-3 System Replacement					
Norwich	New London, CT	0.16	Residential	15	65, Right
Norwich	New London, CT	0.2	Residential	15	65, Right
Norwich	New London, CT	0.7	Residential	20	70, Right
Norwich	New London, CT	0.72	Residential	10	45, Right
Norwich	New London, CT	0.76	Residential	41	66, Left
Norwich	New London, CT	0.78	Residential	39	104, Right
Norwich	New London, CT	1.02	Commercial	20	70, Right
Norwich	New London, CT	1.03	Residential	9	56, Right
Norwich	New London, CT	1.08	Residential	26	82, Left
Norwich	New London, CT	1.13	Residential	8	46, Right
Norwich	New London, CT	1.17	Residential	10	19, Right
Norwich	New London, CT	1.17	Residential	9	50, Left
Norwich	New London, CT	1.37	Residential	4	54, Right
Norwich	New London, CT	1.38	Garage	5	22, Right
Norwich	New London, CT	1.58	Residential	11	40, Right
Norwich	New London, CT	1.59	Residential	35	108, Left
Norwich	New London, CT	1.59	Residential	10	22, Left
Norwich	New London, CT	1.63	Residential	42	142, Right
Norwich	New London, CT	1.77	Residential	10	23, Left

TABLE 4.8.3-1 (cont'd)

Residences and Other Structures Within 50 feet of the Construction Work Area for the HubLine/East to West Project

State/Facility/ Town	County, State	MP	Description of Structure	Approximate Distance from Construction Work Area (feet)	Approximate Distance and Direction from Pipeline Centerline (feet)
Norwich	New London, CT	1.79	Residential	28	78, Right
Norwich	New London, CT	1.83	Residential	42	67, Left
Norwich	New London, CT	1.84	Residential	48	185, Left
Norwich	New London, CT	1.85	Residential	10	32, Right
Norwich	New London, CT	1.92	Residential	10	24, Left
Norwich	New London, CT	1.95	Residential	10	23, Left
Norwich	New London, CT	1.95	Residential	25	90, Right
Norwich	New London, CT	2.02	Residential	50	75, Left
Norwich	New London, CT	2.03	Residential	28	78, Right
Norwich	New London, CT	2.07	Residential	20	70, Right
Norwich	New London, CT	2.49	Residential	9	34, Left
Norwich	New London, CT	2.54	Residential	10	35, Left
Norwich	New London, CT	2.56	Residential	10	38, Right
Norwich	New London, CT	2.56	Residential	11	36, Left
Norwich	New London, CT	2.57	Residential	10	37, Right
Norwich	New London, CT	2.57	Residential	23	72, Right
Norwich	New London, CT	2.58	Residential	11	36, Left
Norwich	New London, CT	2.87	Residential	26	51, Left
Norwich	New London, CT	2.9	Residential	46	74, Left
Norwich	New London, CT	3.2	Residential	8	26, Left
Norwich	New London, CT	3.23	Residential	10	19, Left
Norwich	New London, CT	3.23	Residential	33	55, Left
Norwich	New London, CT	3.24	Commercial	46	146, Right
Norwich	New London, CT	3.27	Residential	34	59, Left
Norwich	New London, CT	3.28	Commercial	10	45, Right
Preston	New London, CT	3.98	Residential	48	141, Right
Preston	New London, CT	4.18	Commercial	41	66, Left
Preston	New London, CT	4.19	Residential	45	70, Left
Preston	New London, CT	4.65	Garage	34	84, Right
Preston	New London, CT	5.51	Residential	14	39, Left
Preston	New London, CT	5.54	Residential	3	25, Right
Preston	New London, CT	5.57	Residential	25	75, Right
Preston	New London, CT	5.64	Residential	11	36, Left
Preston	New London, CT	5.67	Residential	22	72, Right
Preston	New London, CT	7.27	Residential	22	122, Right
Preston	New London, CT	7.89	Residential	37	137, Right
Preston	New London, CT	7.94	Residential	34	59, Left
Preston	New London, CT	7.94	Residential	13	45, Right
Preston	New London, CT	9.4	Building (TBD)	0	46, Right

Algonquin would utilize special construction methods designed for working in confined areas such as residential and commercially developed areas. These special construction methods are described in section 2.3.2 and in Algonquin's E&SCP. Algonquin would implement the following general measures to minimize construction-related impacts on all residences and other structures located within 50 feet of the construction right-of-way:

- attempt to maintain a minimum distance of 25 feet between any residence or business establishment and the edge of the construction work area;
- fence the boundary of the construction work area to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of a residence or business establishment;
- attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions;
- ensure piping is welded and installed as quickly as reasonably possible to minimize the amount of time a neighborhood is affected by construction;
- backfill the trench as soon as possible after the pipe is laid or temporarily place steel plates over the trench; and
- complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting.

Following construction, all residential areas would be restored to preconstruction conditions or as specified in written landowner agreements. Algonquin would reseed all disturbed lawns with a seed mixture acceptable to the landowner or comparable to the adjoining lawn. Landowners would be compensated for damages to ornamental shrubs and other landscape plantings, and would continue to have use of the right-of-way provided it does not interfere with the easement rights granted to Algonquin for construction and operation of the pipeline system. During the scoping period, landowners expressed concerns regarding ORV traffic along the right-of-way. In cooperation with landowners, Algonquin would make efforts to control unauthorized ORV traffic throughout the life of the Project, and signs, gates, and vehicle trails would be maintained as needed.

Algonquin provided site-specific residential construction plans to inform affected landowners of proposed measures to minimize disruption and to maintain access to the 78 residences located within 25 feet of the construction work area for proposed facilities (see Appendix J). These site-specific construction plans include a dimensioned drawing depicting the residence in relation to the pipeline; workspace boundaries; the proposed permanent right-of-way; and nearby residences, structures, roads, and waterbodies. The site-specific plans also include a description of the construction techniques that Algonquin would use to reduce impacts on residences; and how Algonquin would ensure the trench is not excavated until the pipe is ready to be installed and that the trench would be backfilled immediately after pipe installation. We have reviewed the site-specific residential construction plans and find them acceptable. We are, however, specifically seeking comments on these plans. As indicated in table 4.8.3-1, 38 residences would be located within 10 feet of the proposed construction work area. Because of the increased potential for construction of the proposed Project to disrupt these residences, **we recommend that**:

- **<u>Prior to construction</u>, Algonquin should file with the Secretary evidence of landowner concurrence with the site-specific residential construction plans for all locations where construction work areas and fencing would be within 10 feet of a residence.**

We have found that providing a line of communication to landowners by the company assists in addressing construction and restoration issues in and near residential areas. Algonquin has not provided a discussion of how it intends to address landowner issues and concerns during and following construction. Therefore, **we recommend that:**

- **Algonquin should develop and implement an environmental complaint resolution procedure that remains active for at least 3 years following the completion of construction of the E2W Project. The procedure should provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project and restoration of the right-of-way. Algonquin should file the environmental complaint resolution procedures and mail the environmental complaint resolution procedures to each landowner whose property would be crossed by the respective Project with the Secretary <u>prior to construction</u>:**

  a. In its letter to affected landowners, Algonquin should:

    i. provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon to expect a response;

    ii. instruct the landowners that, if they are not satisfied with the response, they should call Algonquin's Hotline, as applicable; the letter should indicate how soon to expect a response; and

    iii. instruct the landowners that, if they are still not satisfied with the response from Algonquin's Hotline, they should contact the Commission's Enforcement Hotline at (888) 889-8030, or at hotline@ferc.gov.

  b. In addition, Algonquin should include in its weekly status reports a table that contains the following information for each problem/concern:

    i. the identity of the caller and the date of the call;

    ii. the identification number from the certificated alignment sheet(s) of the affected property and appropriate location by milepost;

    iii. a description of the problem/concern; and

    iv. an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

Implementation of Algonquin's general construction methods for working in proximity to residences and commercial facilities, site-specific residential construction plans, and our recommended environmental complaint resolution procedure would minimize disruption to residential and commercial areas to the extent practicable and promote restoration of these areas as soon as reasonably possible upon completion of construction.

4.8.3.2 Planned Developments

Algonquin contacted landowners and local officials in the affected municipalities of Massachusetts and Connecticut to identify planned residential or commercial developments within 0.25 mile of the proposed facilities. Planned developments identified within 0.25 mile of the E2W Project are discussed below.

I-10 Extension

Four planned residential developments and one planned commercial development were identified near the I-10 Extension.

- Between MPs 2.54 and 2.67 in Weymouth, an expansion of retail space is proposed on Lot 20 on the easterly side of the proposed pipeline. The landowner is also negotiating to buy and develop the adjoining Mass Electric parcel.

- Between MPs 3.09 and 3.20 in Weymouth, a condominium project is proposed approximately 150 to 300 feet northwesterly of the proposed pipeline. The landowner has applied for the necessary permits and dug test pits for the proposed development.

- Between MPs 7.45 and 7.95 in Holbrook, a 19-house residential subdivision has been approved, although no timetable has been set for construction.

- Between MPs 8.5 and 8.6 in Randolph, four residential lots are currently planned and construction is expected to begin soon. According to the developers, the proposed pipeline would render two of the parcels unbuildable.

- Between MPs 12.38 and 12.48 in Canton, three residential lots are currently before the Canton Planning Board.

Q-1 System Replacement

One planned residential development consisting of four lots was identified near the Q-1 System Replacement between MPs 14.41 and 14.48. The landowner has not indicated a timeframe for the development of the lots.

E-3 System Replacement

A planned 100-unit condominium project was identified near MP 3.5 of the E-3 System Replacement in Norwich, Connecticut.

Rehoboth Compressor Station

A proposed subdivision of more than 50 lots was identified adjacent to the proposed Rehoboth Compressor Station property. The subdivision has received preliminary approval. Approximately 60 percent of the proposed lots would be located within the boundaries of the proposed compressor station property.

Algonquin has stated that it would compensate landowners for impacts on planned developments based on market data provided by licensed real estate appraisers and in accordance with applicable state laws.

4.8.4 Recreation and Special Interest Areas

The proposed facilities would not cross any national or state designated Wild and Scenic Rivers, waterbodies listed on the NRI, Bureau of Land Management land, USDA land, Wetland Reserve Program land, Conservation Reserve Program land, registered natural landmarks, national forests, national parks, state parks, or Indian Reservations. A portion of the I-10 Extension would be located within the Boston Harbor Region and falls under the MassCZM Program (see section 4.8.4.1). The proposed facilities would also affect several recreation and/or special interest areas. Table 4.8.4-1 lists the locations, land ownership, and crossing length for each of these areas. The more sensitive areas are discussed in sections 4.8.4.1 and 4.8.4.2. State of Massachusetts Article 97 lands are discussed in section 4.8.4.1.

One of the primary concerns when crossing recreation and special interest areas is the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, and resources the area aims to protect). Construction would alter visual aesthetics by removing existing vegetation and disturbing soils. Construction would also generate dust and noise, which could be a nuisance to recreational users. Construction could also interfere with or diminish the quality of the recreational experience by affecting wildlife movements or disturbing trails.

In general, impacts on recreational and special interest areas would be temporary and would be limited to the period of active construction, which typically would last only several days to several weeks in any one area. These impacts would be minimized by implementing Algonquin's E&SCP. In addition, Algonquin has proposed general mitigation measures for some of the recreation and special interest areas that would be affected by the proposed Project. Following construction, most open land uses would be able to continue. Algonquin would continue to consult with the landowners of recreation and special interest areas regarding the need for specific construction mitigation measures.

4.8.4.1 Massachusetts

Cranberry Brook Watershed Area of Critical Environmental Concern

The I-10 Extension would cross the Cranberry Brook Watershed ACEC between approximate MPs 5.0 and 6.3 in Braintree and Holbrook, Massachusetts. For approximately 76 percent of the crossing, the I-10 Extension would be within or adjacent to NSTAR's powerline corridor that includes three high voltage lines on two sets of parallel transmission towers.

The Cranberry Brook Watershed ACEC was designated in 1983 under the Massachusetts ACEC Program, and is protected by the MEEA (301 CMR 12.00). The program, established in 1975 and administered by the MassDCR, authorizes and directs the Secretary of the MEEA to identify and designate areas that are of critical environmental concern to Massachusetts. The Cranberry Brook Watershed ACEC is a unique system with a variety of wetland types, including a marsh, a pond, a stream, two quaking sphagnum bogs, and wooded swamps. Despite the relatively urban setting, the ACEC has remained largely unaltered and supports a variety of uncommon plant and animal species. The ACEC is a critical contributor of high-quality water to a larger watershed that feeds the Ricardi Reservoir. The Ricardi Reservoir supplies approximately 50 percent of the water for the town of Braintree, Holbrook, and Randolph, Massachusetts. For additional discussion of this area see sections 4.5.3 and 4.6.1.4.

TABLE 4.8.4-1

Recreation and Special Interest Areas Crossed by the HubLine/East to West Project

State/ Facility	Milepost	Name of Area	Land Ownership	Potential Article 97 Property	Crossing Length (feet)	Area Affected (acres)	
						Const	Oper
Massachusetts							
I-10 Extension							
	3.5 – 3.6	Walter Gagnon Park	City	X	580	1.2	0.7
	3.6 – 3.7	Walter Gagnon Park	City	X	340	0.7	0.4
	5.0 – 5.4	Cranberry Brook Watershed ACEC	Private		2,310	4.5	2.7
	5.4 – 5.6	Cranberry Brook Watershed ACEC	City	X	805	0.9	0.7
	5.6 – 5.7	Cranberry Brook Watershed ACEC	City	X	1,047	5.3	1.5
	5.8 – 6.1	Cranberry Brook Watershed ACEC	City	X	1,538	2.5	1.7
	5.9	Unknown (Town of Braintree)	City	X	0	0.1	0.0
	6.1 – 6.3	Cranberry Brook Watershed ACEC	City	X	1,225	2.4	1.4
	6.9 – 7.0	Unknown (Town of Holbrook)	City	X	206	0.4	0.2
	7.1 – 7.4	Unknown (Town of Holbrook)	City	X	1,764	3.4	2.0
	7.9	Unknown (Town of Randolph)	City	X	134	0.5	0.2
	7.9	Unknown (Town of Randolph)	City	X	69	0.1	0.1
	7.9-8.0	Unknown (Town of Randolph)	City	X	126	0.3	0.1
	8.1	Unknown (Town of Randolph)	City	X	81	0.3	0.0
	8.7 –8.8	Unknown (Town of Randolph)	City	X	474	0.3	0.1
	9.0	Unknown (Town of Randolph)	City	X	136	0.9	0.5
	9.1 –9.2	Unknown	Unknown	X	639	0.4	0.1
	9.7 – 9.8	Unknown (Town of Stoughton)	City	X	227	0.4	0.3
	11.0 –11.0	Unknown (Town of Stoughton)	City	X	412	0.5	0.5
	11.3 – 11.9	Gibson Property	Private		2,873	6.9	3.3
Q-1 System Replacement							
	12.2 – 12.4	Moose Hill Wildlife Sanctuary	Private	X	965	3.7	0.0[a]
	12.4 – 13.1	Moose Hill Farm	Private		3,843	8.0	0.0[a]
	13.2	Moose Hill Farm	Private		43	0.1	0.0[a]
	13.4 – 13.5	Moose Hill Farm	Private		253	1.1	0.0[a]
	13.5 – 13.7	Moose Hill Farm	Private		762	1.8	0.0[a]
	13.7 – 14.1	Moose Hill Wildlife Sanctuary	Private	X	2,231	5.9	0.0[a]
	14.1 – 14.4	Moose Hill Wildlife Sanctuary	Private	X	1,829	3.7	0.0[a]
	14.8 – 14.9	Unknown (Town of Sharon)	City	X	728	2.9	0.0[a]
	14.9 – 15.1	Macintosh Farm Community Association	Private		829	1.6	0.0[a]
	15.1	Unknown (Town of Sharon)	City	X	208	2.9	0.0
	15.2 – 15.3	Unknown (Town of Sharon)	City	X	722	0.8	0.0[a]
	15.7 – 16.3	Unknown (Town of Sharon)	City	X	3,165	6.4	3.7
	16.3 – 16.4	Canton Fish & Game Association Facilities	Private		702	0.9	0.5
	17.1 – 17.2	Unknown (Town of Canton)	City	X	416	3.6	1.9
	18.5 – 18.7	First United Methodist Church of Stoughton	Private		1,067	2.1	0.0[a]
	18.7 – 19.0	Irish Cultural Centre of New England	Private		1,186	3.3	0.0[a]
Connecticut							
E-3 System Replacement							
	2.3 – 2.5	Mohegan Park	City		1,200	2.2	0.0[a]
	2.5 – 2.6	New Apostolic Church	Private		202	0.5	0.0[a]
	9.3 – 9.4	Mashantucket Pequot Tribal Nation Reservation	Private		428	0.5	0.0[a]
	9.4 – 9.6	Mashantucket Pequot Tribal Nation Reservation	Private		641	1.5	0.0[a]

TABLE 4.8.4-1 (cont'd)

Recreation and Special Interest Areas Crossed by the HubLine/East to West Project

State/ Facility	Milepost	Name of Area	Land Ownership	Potential Article 97 Property	Crossing Length (feet)	Area Affected (acres)	
						Const	Oper
	9.8 – 10.6	Mashantucket Pequot Tribal Nation Reservation	Private		4,297	8.0	0.0[a]
	10.6 – 11.0	Lake of Isles Golf Course	Private		2,500	4.0	0.0[a]
	11.0	Mashantucket Pequot Tribal Nation Reservation	Private		265	1.3	0.0[a]

[a] The acreage of construction impact for these areas reflects the new permanent right-of-way and does not include the existing NSTAR right-of-way.

As discussed in section 4.5.3, Algonquin is currently consulting with both the MassNHESP and the MassDCR to identify an appropriate native seed mix that would be utilized in the Cranberry Brook Watershed ACEC area and we are recommending that Algonquin file a description of the native seed mix that would be used along with the comments of the MassNHESP and the MassDCR on the selected seed mix. As also discussed in section 4.5.3, Algonquin has conducted field surveys of the proposed right-of-way within the ACEC area and has determined that non-native invasive plant species are pervasive and well established. The implementation of the measures included in Algonquin's Invasive Plant Species Control Plan (see Appendix L) and the use of a native seed mix would help minimize the re-establishment of non-native species and promote the establishment of native species in the disturbed area.

Moose Hill Wildlife Sanctuary

The Moose Hill Wildlife Sanctuary is crossed by the existing Q-1 system and would be crossed by the Q-1 System Replacement between approximate MPs 12.2 and 12.4 and MPs 13.7 and 14.4 in Sharon, Massachusetts. The Moose Hill Wildlife Sanctuary is a nearly 2,000-acre wildlife sanctuary that is owned and managed by the Massachusetts Audubon Society. The sanctuary is the Massachusetts Audubon Society's oldest sanctuary and one of the largest. Along with a 25-mile-long trail system, it supports a diverse assemblage of plant communities and habitat types. These include forest lands, large wetland systems, and early successional plant communities such as scrub-shrub, open grasslands, and rock outcrop areas. The sanctuary is currently divided by the existing NSTAR right-of-way, as well as the existing Q-1 system right-of-way. For additional discussion of this area see section 4.6.1.4.

Moose Hill Farm

The Moose Hill Farm is crossed by the existing Q-1 system and would be crossed by the Q-1 System Replacement between approximate MPs 12.4 and 13.7 in Sharon, Massachusetts. The farm is a 347-acre property abutting the Moose Hill Wildlife Sanctuary and owned by the Trustees of Reservations, which is a private land trust that preserves Massachusetts properties of exceptional scenic, historic, and ecological value for public use and enjoyment. The Trustees of Reservations acquired the Moose Hill Farm in 2004 and converted a portion of the property into one of the organization's administrative campuses. The remainder of the property supports a diverse assemblage of habitat types and plant communities and is rich with natural, cultural, and scenic resources. For additional discussion of this area see section 4.6.1.4.

Canton Fish & Game Association Facilities

The Canton Fish & Game Association is a non-profit sportsman's club that owns 11 acres of woods and wetlands in Canton, Massachusetts. This property is crossed by the existing Q-1 system and would be crossed by the Q-1 System Replacement between MPs 16.3 and 16.4. On the property, the Association operates two outdoor firearm ranges for trap and pistol shooting, an archery range for bowhunters and archers, and a stocked fishing stream.

Irish Cultural Centre of New England

The Irish Cultural Centre of New England (Centre) is crossed by the existing Q-1 system and would be crossed by the Q-1 System Replacement between MPs 18.7 and 19.0 in Canton, Massachusetts. The Centre is privately funded and is dedicated to the promotion and organization of Irish cultural, educational, sporting, and social events. The Centre consists of a 46-acre wooded campus with three athletic fields, a children's play area, a library, and an extensive activity center with performance and function space. The Centre plans to further develop the campus to include a performing arts center, an expanded library center, a genealogy center, and a museum. Throughout the year, weekly events are held

at the Centre, as well as the Irish Connections Festival of Music and Arts, which is held every summer. Currently, the existing Q-1 system crosses a mowed athletic field, a paved parking lot, and an emergent forested wetland in the existing right-of-way.

Gibson Property

During the scoping period, several comments were received about the Gibson Property around Glen Echo Pond. The Gibson Property would be crossed by the proposed I-10 Extension between MPs 11.3 and 11.9 in Stoughton, Massachusetts. The Gibson Property is the former site of the Glen Echo Resort, which operated during the 1940s. A network of the former resort's hiking trails still exists on the property. Due to the historical and recreational value of the property to the Town of Stoughton, the Open Space Committee has designated the property as the most important preservation target in the Town of Stoughton. The Gibson Property is Algonquin's preferred site for wetland mitigation for the Project and Algonquin has entered into a signed Agreement with the Town of Stoughton to acquire and transfer the entire 96-acre site to the town. For additional discussion of this site and the Agreement between Algonquin and the Town of Stoughton see section 4.4.4.

Coastal Zone Management Areas

The I-10 Extension would cross the boundary of the MassCZM's Boston Harbor Region at the Weymouth Fore River between MPs 0.0 and 0.7 in the Towns of Weymouth and Braintree, Massachusetts. Algonquin plans to cross the Weymouth Fore River using the HDD method, which, if successful, would avoid impacts on the waterbody. In response to the federal CZMA, Massachusetts developed a coastal zone management plan consisting of program policies that articulate priorities for protection and management of its coastal resources. The MassCZM is not a permitting authority, but any federal project proposed within the coastal zone must be found to be consistent with CZM program policies and approved by the MassCZM before the activity can take place.

The MassCZM program policies most pertinent to the E2W Project and HDD activities include, but are not limited to: water quality, habitat, protected areas, energy facilities, and ocean resources. Algonquin plans to demonstrate that the HDD crossing of the Weymouth Fore River is a non-coastally dependent energy facility with limited to no other alternatives to connect Algonquin's existing Weymouth Fore River Meter Station to the interstate natural gas distribution pipelines. In order to obtain a consistency determination, Algonquin would have to demonstrate that the construction and operation of the E2W Project would be consistent with the applicable management principles and program policies of the MassCZM Program. Algonquin would file an application with the MassCZM seeking a consistency determination; however, the MassCZM would not issue a determination until the applicable state permits and licenses have been issued and review under MEPA is complete.

In order to achieve consistency with the MassCZM program policies, Algonquin plans to:

- ensure that the Project meets state water quality and protection standards by seeking a section 401 Water Quality Certification and a Chapter 91 Waterways License from the MassDEP;
- ensure that that the Project is in compliance with the MWPA by seeking Orders of Conditions from affected local Conservation Commissions;
- seek a determination from the COE that the Project is in compliance with its regulations regarding activities in navigable waters and the discharge of dredged or fill materials;

- consult with NOAA Fisheries and the FWS to minimize impacts on the coastal and marine environment and ensure the protection of ecologically significant resources;

- work in coordination with the MassDMF to avoid and minimize impacts on marine habitat; and

- use HDD technology to ensure that construction impacts in coastal hazard areas would be minimal and temporary.

If the E2W Project is approved by the Commission, concurrence from the MassCZM that the Project is consistent with CZM program policies must be received before construction. Therefore, **we recommend that:**

- **Algonquin should file documentation of concurrence from the MassCZM that the E2W Project is consistent with CZM program policies with the Secretary <u>prior to construction</u>.**

State of Massachusetts Article 97 Lands

In 1972, Massachusetts voters approved Amendment Article 97 (Article 97) to the state Constitution, requiring that any land or easements taken or acquired for natural resource purposes shall not be used for other purposes unless approved by each branch of the Massachusetts legislature by a two-thirds vote. Article 97 is intended to ensure that lands acquired for conservation purposes, referred to as natural resource lands, are not converted to other uses.

Article 97 does not specifically define the types of lands covered, but the Attorney General issued an opinion in 1973 defining "natural resources" to include, without limitation, "air, water, wetlands, rivers, streams, lakes, ponds, coastal, underground and surface waters, flood plains, seashores, dunes, marine resources, ocean, shellfish and inland fisheries, wild birds including song and insectivorous birds, wild mammals and game, sea and fresh water fish of every description, forests and all uncultivated flora, together with public shade and ornamental trees and shrubs, land, soil and soil resources, minerals and natural deposits, agricultural resources, open spaces, natural areas, and parks and historic districts or sites." Article 97 applies to land, easements, and interests owned or held by the Commonwealth or its political subdivisions.

In 1998, the MEEA adopted an Article 97 Land Disposition Policy that seeks to protect, preserve, and enhance all public open space areas covered by Article 97 through a process of interagency review of proposed dispositions. This policy defines an Article 97 land disposition as: "(a) any transfer or conveyance of ownership or other interests; (b) any change in physical or legal control; and (c) any change in use, in and to Article 97 land or interests in Article 97 land owned or held by the Commonwealth or its political subdivisions, whether by deed, easement, lease or any other instrument effectuating such transfer, conveyance or change. A revocable permit or license is not considered a disposition as long as no interest in real property is transferred to the permittee or licensee, and no change in control or use that is in conflict with the controlling agency's mission, as determined by the controlling agency, occurs thereby."

Algonquin conducted title research on numerous properties to determine the Article 97 properties that would be affected by the E2W Project. Table 4.8.4-2 lists by milepost the known Article 97 properties that would be crossed and the vegetation cover that would be impacted. Other potential Article 97 properties are listed in table 4.8.4-1.

TABLE 4.8.4-2

Article 97 Properties Crossed by the HubLine/East to West Project

State/Facility/ Municipality	Milepost Range	Site Name / Ownership	Forest Land[a]		Open Land [b]		Total	
			Const [c]	Perm [d]	Const	Perm	Const	Perm
Massachusetts								
I-10 Extension								
Weymouth	3.5 - 3.6	Town of Weymouth	3.2	0.2	0.9	0.5	1.2	0.7
Weymouth	3.6 - 3.7	Town of Weymouth	2.5	0.2	0.5	0.2	0.7	0.4
Braintree	5.4 - 5.6	Town of Braintree Conservation Commission	0.9	0.7	0.1	<0.1	0.9	0.7
Braintree	5.8 - 6.1	Town of Braintree Conservation Commission	2.1	1.3	0.4	0.4	2.5	1.7
Holbrook	6.1 - 6.3	Town of Holbrook Conservation Commission	2.2	1.3	0.2	0.1	2.4	1.4

[a] Includes central hardwoods-hemlock-white pine, the transition hardwoods-white pine, and forested wetlands.

[b] Includes pastures, open fields, existing right-of-way, herbaceous and scrub-shrub uplands, non-forested lands, emergent wetland, scrub-shrub wetland, and roads.

[c] The construction right-of-way includes the total of the existing permanent pipeline right-of-way, new permanent pipeline right-of-way, and temporary extra workspace/staging areas.

[d] The permanent right-of-way includes new Algonquin pipeline right-of-way required for the Project that will be maintained as part of its operation. The new permanent right-of-way width for the I-10 Extension would generally be 50 feet.

Note: The acreage totals shown in this table may not equal the sum of addends due to rounding.

4.8.4.2 Connecticut

Mohegan Park

The Mohegan Park would be crossed by the E-3 System Replacement between MPs 2.3 and 2.5 in Norwich, Connecticut. The park is currently considered as preserved open space open to the public and owned by the City of Norwich. Activities available at the park include swimming, picnic areas, fishing, and nature trails. The park also houses flower gardens and a memorial rose garden.

Mashantucket Pequot Tribal Nation Reservation

The existing Q-1 system crosses the Mashantucket Pequot Tribal Nation Reservation in three locations. One crossing is in Preston, Connecticut between MPs 9.31 and 9.56. The two remaining crossings are in Ledyard, Connecticut between MPs 9.75 and 10.57 and MPs 10.96 and 11.01. The reservation is a 1,250-acre wooded parcel where many members of the Mashantucket Pequot Tribal Nation currently live. It is owned by the Mashantucket Pequot Tribal Nation and is one of the oldest, continuously occupied Native American reservations in North American. The reservation currently includes a sand and gravel business, the Foxwoods Resort Casino, and the Mashantucket Pequot Museum and Research Center.

Lake of Isles Golf Course

The existing E-3 system parallels the edge of the Lake of Isles Golf Course between MPs 10.6 and 11.0 in North Stonington, Connecticut. The Lake of Isles Golf Course is owned by the Mashantucket Pequot Tribal Nation and consists of a private course and a resort course on over 900 acres. The pipeline would parallel a short portion of the golf course along the edge of a fairway. Disruption and noise during

construction could temporarily restrict the activities of golfers. The degree of impact would depend on the timing of construction. Construction of the pipeline during the summer months when golfing activities are at their peak would cause more of a disruption than construction during the off-peak, winter months. Some of the construction-related impacts would be unavoidable; however, the duration of the impacts would be short term and, due to the short length of property affected, construction-related impacts should be minimal. Operation of the pipeline would not affect long-term golfing activities because the pipeline would be installed within Algonquin's existing easement and the right-of-way would be allowed to revert to former use.

4.8.5 Hazardous Waste

Hazardous Waste Sites and Landfills

Based on a review of the following federal, state, and local government environmental databases, 145 potential and actual hazardous waste sites and landfills were identified within 1,000 feet of the pipeline centerlines and within a 0.5-mile radius of the Rehoboth Compressor Station:

- Underground/Aboveground Storage Tanks, as defined by the EPA;
- Leaking Underground/Aboveground Storage Tanks, as defined by the EPA;
- Polychlorinated biphenyls (PCBs) Activity Database System;
- Facility Index System;
- Resource Conservation and Recovery Act Large Quantity Generators and Small Quantity Generators, as defined by the EPA;
- Release Sites (those releases of oil and hazardous materials that have been reported to the MassDEP and the CTDEP);
- Landfills/Transfer Stations;
- Emergency Response Notification System;
- Corrective Action Report;
- Comprehensive Environmental Response, Compensation, and Liability Information System (including National Priority List sites);
- Hazardous Materials Information Reporting System;
- Toxic Substances Control Act;
- Toxic Chemical Release Inventory System;
- Activity and Use Limitation;
- Sites with Institutional Controls;
- Oil & Chemical Spill Databases;

- Integrated Compliance Information System;
- Inventory of Hazardous Disposal Sites;
- Site Discovery and Assessment Database (those sites where it is suspected that hazardous waste may have been disposed, or sites that are eligible for listing on the State Inventory of Hazardous Waste Disposal);
- Connecticut Leachate and Wastewater Discharge Sites; and
- Sites involved in the Voluntary Remediation Program.

Based on a review of these databases, the I-10 Extension would be located within 1,000 feet of 76 sites, the Q-1 System Replacement would be located within 1,000 feet of 64 sites, and the E-3 System Replacement would be located within 1,000 feet of 5 sites. No contaminated or potentially contaminated sites were identified within a 0.5-mile radius of the Rehoboth Compressor Station.

A subsequent review of files at the MassDEP and the CTDEP identified seven sites where a higher potential exists to encounter contamination during Project construction. These sites consist of three landfills in the vicinity of the proposed I-10 Extension, one landfill and two contaminated sites in the vicinity of the proposed Q-1 System Replacement, and one contaminated site in the vicinity of the proposed E-3 System Replacement. As shown in table 4.8.5-1, four of the sites are located at least 800 feet from the proposed Project and, thus, are unlikely to impact the Project. Additional information regarding the remaining three sites is provided below.

TABLE 4.8.5-1

Hazardous Waste Sites and Landfills Within 1,000 feet of the HubLine/East to West Project

State/Pipeline Facility	Milepost	Hazardous Waste Site Name	Details	Distance from Centerline (feet)
Massachusetts				
I-10 Extension				
	2.7	Weymouth Landfill	Landfill	0
	4.2	Braintree Compost Site	Landfill	1,000
	10.1	Stoughton Landfill	Landfill	0
Q-1System Replacement				
	17.5	Greenbrook Condominium Association	Solvent contamination	800
	17.5	Industrial Property	Solvents detected in onsite well	1,000
	17.6	Canton Landfill	Landfill	1,000
Connecticut				
E-3 System Replacement				
	3.3	Guarnaccia Property	The site consists of 1.33 acres of land that was previously occupied by a gas station. Petroleum-impacted soils have been identified on the site at depths of 0 to 12 feet. Fill material containing elevated concentrations of petroleum, semi-volatile organic compounds, and polychlorinated biphenols have been identified on the central portion of the site. No impacts on shallow groundwater beneath the site were identified.	0

The I-10 Extension would cross the Weymouth Landfill in Weymouth, Massachusetts near MP 2.7. The Weymouth Landfill was operated as a municipal solid waste landfill from 1924 to 1949, is currently inactive, and is not lined or capped. Additional information regarding the landfill is unavailable from the Weymouth Health Department and the MassDEP. Algonquin noted that a portion of the landfill has been redeveloped with a retail store and parking lot, and believes that the potential to encounter hazardous materials during construction in the former landfill is low because it was common practice for operators to burn the waste during the time the Weymouth Landfill was active.

During the scoping period, TW Conroy 5 LLC (TWC) expressed concerns about the impacts of the I-10 Extension on the Stoughton Landfill in Stoughton, Massachusetts. The landfill would be crossed near MP 10.1. The landfill is a 33-acre unlined municipal waste disposal site that has been inactive since 1976, except for a post-closure yard waste composting operation. TWC is currently working with the Town of Stoughton and the MassDEP to cap and close the landfill. At the time of TWC's comments, the I-10 Extension was proposed to be collocated along the eastern side of the NSTAR powerline right-of-way and adjacent to the landfill for approximately 1,650 feet beginning near MP 9.8. TWC indicated that such an alignment would be incompatible with the approved landfill closure design, which involves construction along the east side of NSTAR's right-of-way and Reebok Drive. As indicated in table 3.5-1, Algonquin revised its originally proposed route in response to TWC's concerns, and now proposes to install the pipeline along the opposite (western) side of the NSTAR right-of-way and Reebok Drive from the landfill. Based on our review of drawings provided by TWC, this alignment would not appear to impact the landfill closure plans.

Other information obtained by Algonquin indicates that contaminated sediments and groundwater occur at the Stoughton Landfill, and that the lateral extent of buried solid waste to the west (towards the NSTAR right-of-way) has not been fully characterized. Therefore, there is a potential to encounter contaminated media and buried solid waste during construction of the I-10 Extension. Algonquin plans to conduct a field investigation to evaluate the presence of hazardous waste within the proposed I-10 Extension right-of-way. This work will likely include the use of test pits and/or soil borings in conjunction with soil and groundwater sample analysis.

The proposed E-3 System Replacement would cross a contaminated site near MP 3.3 (the Guarnaccia Property) in Norwich, Connecticut. The site consists of 1.3 acres of land that was previously occupied by a gas station that has since been demolished. A Phase I Environmental Site Assessment conducted at the site indicated the presence of petroleum-impacted soils between 0 and 12 feet deep, and semi-volatile organic compounds and PCBs were detected at the central portion of the site. Algonquin plans to further investigate the environmental issues at this site but, based on the available information, does not propose to modify the current alignment through this property.

Algonquin would develop a Contamination Contingency Plan to address contaminated media if encountered during construction of the E2W Project. The plan would comply with all federal, state, and local regulations and will be submitted to the appropriate federal, state, and local regulatory agencies for review and approval. In general, if unanticipated hazardous materials/waste are encountered or suspected during construction, all construction work in the immediate vicinity would be halted until an appropriate course of action is determined. Because the Contamination Contingency Plan is not yet available to allow us to determine whether it would adequately minimize impacts if unanticipated hazardous materials/waste are encountered or suspected during construction, **we recommend that:**

- **Algonquin should file the Contamination Contingency Plan with the Secretary for review and written approval by the Director of OEP <u>prior to construction</u>.**

In addition to the Contamination Contingency Plan and if required, Algonquin would develop a Utility-Related Abatement Measure Plan (URAM Plan) under the Massachusetts Contingency Plan (MCP) (310 CMR 40.0460). The URAM Plan would be required for areas in Massachusetts where soil or groundwater sampling indicates contamination exceeding Reportable Concentrations as defined in the MCP.

Algonquin's route modifications and plans discussed above appear to be appropriate measures. However, to minimize the potential to encounter contaminated media or buried solid waste and ensure that any such waste would be properly managed, **we recommend that:**

- **Algonquin should prepare a report describing the results of its investigations in proximity to the Stoughton Landfill near MP 10.0 of the I-10 Extension and at the Guarnaccia Property near MP 3.3 of the E-3 System Replacement. This report should describe the methods used to investigate each site, all laboratory test results, a discussion of regulations applicable to the findings, and any proposed mitigation measures, if warranted. Algonquin should also provide a copy of the URAM Plan if one is required. This report and the URAM Plan should be filed with the Secretary for review and written approval by the Director of OEP <u>before commencing construction at MPs 9.6 to 10.3 of the I-10 Extension and MPs 3.2 to 3.4 of the E-3 System Replacement</u>.**

Polychlorinated Biphenyl's

PCBs are a blend of chemical compounds that were used in a variety of industrial applications until their commercial manufacture was banned by the EPA in 1979. Before then, PCBs were introduced into many natural gas transmission lines in the United States through the use of PCB-containing lubricants at compressor station sites and in other operation and maintenance activities. Since 1981, the EPA has worked with pipeline operators to identify and remove PCBs from the nation's natural gas transmission systems.

Algonquin would remove any existing piping or equipment that has been in contact with natural gas in accordance with the EPA's PCB regulations contained within Title 40 CFR Part 761, as revised (CFR: June 29, 1998, Volume 63, No. 124) and in accordance with its Standard Operating Procedure. As described below, Algonquin's process of removing pipe and equipment from gas service includes liquids removal, inspecting for additional liquids during pipe removal, cutting and removal of pipe, sampling for the presence of PCBs within the removed parts, and appropriate disposal.

Liquids may be removed using pigging, draining valves and equipment, and purging methods. Pigging is required prior to removal of pipe and equipment except when the pipe or equipment cannot be pigged due to size or configuration. Purging of the line using nitrogen or air may be used to further dry the pipeline. Pipe and equipment would be inspected for liquids during removal at low points and water crossings. If liquids are found during the inspection process, they would be removed and handled appropriately.

The removed pipe and equipment would be transferred to an existing Algonquin maintenance facility where wipe sampling for PCBs would be conducted to classify the materials as unrestricted ($\leq$10 micrograms per 100 square centimeters ($\mu g/100\ cm^2$)), conditional (>10 and <100 $\mu g/100\ cm^2$) or restricted ($\geq$100 $\mu g/100\ cm^2$). Unrestricted materials may be stored without restriction and sold at Algonquin's discretion. Conditional and restricted material may be decontaminated or disposed of at a Toxic Substances Control Act landfill in accordance with all applicable federal and state regulations.

4.8.6 Visual Resources

Pipeline Facilities

Visual resources along the proposed pipeline routes are a function of geology, climate, and historical processes, and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. Although stretches of upland forest are present along the proposed routes, the majority of the pipelines (about 80 percent) would be installed within or parallel to existing rights-of-way. These existing rights-of-way are maintained periodically on different schedules, using different methods of maintenance. As a result, along the majority of the proposed Project, visual resources have been previously affected by other activities.

Algonquin proposes to generally use a 75- or 85-foot-wide nominal construction right-of-way, consisting of 30 feet of permanent right-of-way and 45 feet of temporary construction workspace in Connecticut, and 50 feet of permanent right-of-way and 35 feet of temporary construction workspace in Massachusetts. Some areas would be widened for additional temporary extra workspaces required for construction at waterbody, road, and utility crossings as well as in areas of difficult terrain. Visual impacts associated with the construction right-of-way and temporary extra workspaces would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, blasting (if required), rock formation alteration or removal, and machinery and tool storage. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value; the removal or alteration of vegetation that may currently provide a visual barrier; or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline routes parallel or cross roads and the pipeline right-of-way may be seen by passing motorists, on residents where vegetation used for visual screening of existing utility rights-of-way or for ornamental value would be removed, and in forested areas. The duration of visual impacts would depend on the type of vegetation that is cleared or altered. The impact of vegetation clearing would be shortest in areas consisting of short grasses and scrub-shrub vegetation and in agricultural crop and pasture lands, where the re-establishment of vegetation following construction would be relatively fast (generally less than 5 years). The impact would be greater in forest land, which would take many years to regenerate mature trees. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation types to regenerate and would be prevented from re-establishing on the permanent right-of-way.

In locations where trees that serve as a visual buffer would be removed, Algonquin would discuss these screening issues with individual landowners during easement negotiations. In areas where all visual screening is removed, Algonquin would consider strategic planting of fast-growing evergreens. As discussed in section 4.8.1 and shown in table E-1 in Appendix E, we requested that Algonquin provide site-specific justification for all areas where a wider construction right-of-way or temporary extra workspaces would be needed and specify the land use (vegetative cover type) that would be affected by each extra workspace. Our decision whether to approve or deny the request took vegetative cover type into consideration and to ensure unnecessary tree clearing is avoided, particularly if the clearing would remove trees that provide visual screening.

As discussed above, about 80 percent of the proposed pipeline routes would be located within or adjacent to existing rights-of-way. Construction within or adjacent to existing rights-of-way typically reduces impacts on visual resources because it minimizes vegetation clearing for the construction work areas and permanent right-of-way and also minimizes new fragmentation of vegetation. At the HDD crossings, no impacts on visual resources are anticipated because only selective clearing of vegetation would occur between the drill entry and exit points.

After construction, all disturbed areas would be restored and returned to preconstruction conditions in compliance with federal, state, and local permits; landowner agreements; and Algonquin's easement requirements, with the exception of aboveground facility sites, discussed further below.

Aboveground Facilities

The aboveground facilities associated with the E2W Project would be the most visible features and would result in long-term impacts on visual resources. The magnitude of these impacts depends on factors such as the existing landscape, the remoteness of the location, and the number of viewpoints from which the facility could be seen.

The proposed Rehoboth Compressor Station would consist of an acoustically-treated, metal-sided compressor building approximately 100 feet long, 80 feet wide, and 26 feet high. The compressor station building would include an approximately 40-foot-tall turbine exhaust emissions stack. Additional metal-sided buildings at the compressor station site would include: a control/auxiliary building approximately 70 feet long, 40 feet wide, and 16 feet high; an office/warehouse building approximately 70 feet long, 65 feet wide, and 12 feet high; a garage building approximately 60 feet long, 40 feet wide, and 16 feet high; a products storage building approximately 20 feet long, 12 feet wide, and 12 feet high; and a domestic gas and meter building approximately 20 feet long, 16 feet wide, and 16 feet high. Other equipment that would be installed includes a station suction scrubber, discharge gas coolers, instrument air compressor, instrument air reservoir, a natural gas-fired boiler for building heat, a natural gas-fired emergency generator, source control facilities, and an emergency shutdown blowdown silencer.

The proposed compressor station site is located in an area of upland forest near the center of a 97-acre parcel of land. We identified 59 residences within 0.5 mile of the proposed compressor station; however, all residences are located at least 0.25 mile from the site and views of the station would be limited by existing dense mature forest. Within the 97-acre parcel of land, the permanent station footprint would be approximately 10.3 acres. In addition to the 10.3 acres, about 6.5 acres of temporary extra workspace would be required for construction activities.

Algonquin does not plan to develop the remaining portions of the parcel, with the exception of an entrance driveway off of Finnigan's Way. As a result, the remaining 85.4 aces of the parcel Algonquin proposes to acquire for the Rehoboth Compressor Station would be preserved as screening and buffering for the compressor station or potentially used as conservation or mitigation areas. Therefore, the facility would be well-buffered from adjacent properties by existing dense mature forest. Based on recommendations made by Town of Rehoboth public officials, Algonquin proposes to construct the compressor station permanent access road with numerous bends. This winding design would eliminate a tunnel-effect along the access road and ensure that the compressor station facilities are not visible from Tremont Street. Additionally, Algonquin would limit outdoor lighting to the levels necessary for safety and security reasons.

During the scoping period, a concern was raised about the visual impacts of the emissions from the proposed compressor station. The non-water vapor emissions from the natural gas-fired combustion turbine proposed for the Rehoboth Compressor Station would be subject to visible opacity limits as defined by 310 CMR 7.06(1). The combustion of natural gas would ensure that the emissions from the proposed turbine comply with the visible opacity standard. By implementing the mitigation measures described above, the visual impact of the proposed Rehoboth Compressor Station facility would not have a significant effect on the aesthetics of the existing landscape.

The proposed Beginning-of-Q-1 System and End-of-Q-1 System OPP regulator stations would include control valve actuators and pipe blowdown vents that would be approximately 7 to 8 feet tall.

Each of these OPP regulator stations would be housed within a 10-foot tall building and, as such, these facilities would not have a significant impact on the surrounding visual character. The other two OPP regulator stations would be installed at the existing Fore River and Sharon Meter Stations. The remaining aboveground facilities consisting of pig launcher/receivers, mainline valves, taps, and blow-off valves, consist of small structures that would be located either within the fenceline of existing or other proposed aboveground facilities, or within or near the pipeline right-of-way. In general, these other aboveground facilities would not result in a significant impact on the surrounding visual character of the Project area. However, in section 3.6.2 we are recommending that Algonquin provide an alternatives site analysis for the proposed blow-off valve near MP 1.3 along the I-10 Extension, where construction of the blow-off valve would require the removal of vegetative screening in proximity to several residences.

Algonquin would continue to work with landowners and applicable agencies to address the need for visual screening of aboveground facilities.

Abandoned Facilities

In areas along the Q-1 and E-3 System Replacements where the pipelines may be abandoned in place, the existing pipeline is located below ground, so the abandonment of these segments would not result in additional permanent impacts on visual resources.

Pipe Storage and Contractor Ware Yards

With the possible exception of minor grading activities and surfacing, soils at the pipe storage and contractor yards would not be disturbed. As a result, there would be no permanent impacts on visual resources associated with the use of these yards.

Access Roads

Algonquin proposes to use 38 existing roads for temporary right-of-way access during construction and 13 existing or to be created roads for permanent right-of-way or aboveground facility access. The existing access roads are paved, gravel, or dirt roads that may be improved as needed for construction and operations/maintenance. Because the majority of these are existing roads, use as access roads would not result in significant increased impacts on visual resources.

Four new access roads and modifications to three roads would be required for the Project, all of which would be retained as permanent access roads. The establishment of these new permanent access roads would constitute a permanent visual impact. However, due to the generally developed nature of the Project area, these new and modified roads would not be inconsistent with similar roadways in the area and thus would not result in a significant impact on visual resources in the area.

4.8.7 NSTAR Alternative

The NSTAR Alternative deviates from the proposed I-10 Extension near MP 10.5 in Stoughton, Massachusetts. The alternative would proceed generally west along the NSTAR powerline right-of-way for about 1.3 miles. The alternative would then proceed generally northwest and create new right-of-way for about 1.4 miles until the alternative intersects the with Q-1 system, less than 0.1 mile north of Pleasant Street in Canton, Massachusetts.

A land use comparison of the NSTAR Alternative with the corresponding segment of the proposed route is presented in table 4.8.7-1. The corresponding segment of the proposed route consists of MPs 10.5 to 12.9 of the proposed I-10 Extension and MPs 18.5 to 19.7 of the Q-1 System Replacement.

TABLE 4.8.7-1

Land Use Comparison of the NSTAR Alternative with the Corresponding Segment of the Proposed I-10 Extension

Environmental Factor	Unit	NSTAR Alternative	Corresponding Segment of the Proposed Route
Total Length	Miles	2.7	3.5
Adjacent to Existing Right-of-way	Miles	1.4	1.1
Roads Crossed	Number	6	6
Structures within 50 feet of the Construction Right-of-Way	Number	1	8
Temporary Access Roads	Number	2	1
Permanent Access Roads	Number	1	1
Planned Developments	Number	2	1
Crossings of Recreation and Special Interest Areas	Number	10	5
Crossings of Article 97 Properties	Number	14	3
Hazardous Sites within 1,000 feet	Number	3	0

Of the 2.7-mile-long NSTAR Alternative, approximately 52 percent (1.4 miles) would be adjacent to existing rights-of-way, whereas approximately 31 percent of the proposed route would be collocated with existing rights-of-way. Construction and operation of the alternative would require two temporary access roads and one permanent access road. Construction and operation of the corresponding segment of the proposed route would require one temporary access road and one permanent access road. Both the alternative and the corresponding segment of the proposed route would cross six roads.

There is one existing residential or commercial structure located within 50 feet of the NSTAR Alternative construction work area, and eight existing residential or commercial structures located within 50 feet of the construction work area of the corresponding segment of the proposed route. Based on contact with county planning officials and landowners, Algonquin has identified two proposed developments along the NSTAR Alternative, whereas one planned residential development has been identified along the corresponding segment of the proposed route.

The NSTAR Alternative would involve 10 crossings of special management areas or other recreational and public interest areas, whereas the corresponding segment of the proposed route would involve 5 crossings. During the scoping period, several comments were received regarding the proximity of the NSTAR Alternative to the New England Sinai Hospital and the Dawe Elementary School. The hospital and school are located 700 feet and 300 feet from the NSTAR Alternative, respectively.

Algonquin has identified 14 potential Article 97 properties that would be crossed by the NSTAR Alternative. The corresponding segment of the proposed route would involve three crossings of potential Article 97 properties. Neither the NSTAR Alternative nor the corresponding segment of the proposed route would cross any areas under MassCZM jurisdiction.

A review of federal and state hazardous material site databases identified three sites within 1,000 feet of the NSTAR Alternative. No hazardous material sites have been identified within 1,000 feet of the corresponding segment of the proposed route.

Temporary and permanent visual impacts of the NSTAR Alternative would be similar to those of the corresponding segment of the proposed route.

4.9 SOCIOECONOMICS

The E2W Project would consist of 31.4 miles of various diameter pipeline and associated pipeline support facilities, including compression facilities. Of this amount, 12.9 miles consist of new pipeline in Massachusetts and 18.5 miles consist of upgrades to existing pipeline in Massachusetts and Connecticut.

The I-10 Extension would involve the construction of approximately 12.9 miles of new 36-inch-diameter pipeline from MP 0.0 in the Town of Weymouth to MP 12.9 in the Town of Canton, Norfolk County, Massachusetts. The Q-1 System Replacement would involve the installation of approximately 7.5 miles of 36-inch-diameter pipeline that would replace a segment of an existing 24-inch-diameter pipeline from MP 12.2 in the Town of Sharon to MP 19.7 in Canton, Norfolk County, Massachusetts. The E-3 System Replacement would involve the installation of approximately 11.0 miles of 12-inch-diameter pipeline that would replace a segment of an existing 6- and 4-inch-diameter pipeline from MP 0.0 in the City of Norwich to MP 11.0 in the Town of North Stonington, New London County, Connecticut. The proposed Project would also include the construction and operation of a new compressor station near Algonquin's G-5 tap at about MP 16.8 on the G-1 system in the Town of Rehoboth, Bristol County.

Some of the potential socioeconomic effects from construction, operation, and maintenance of the Project are related to the number of construction workers that would work on the Project and their impact on population, public services, and temporary housing during construction. Other potential effects are related to construction, such as increased traffic or disruption of normal traffic patterns. Other effects associated with the Project include increased property tax revenue, increased job opportunities, and increased income associated with local construction employment.

The potential impact of the Project on land use and residences in the Project area is discussed in section 4.8.1. A discussion of the Project's effects on population and employment, housing, public services, transportation and traffic, and tax revenue is provided below as well as a discussion of the impact of the Project on property values.

4.9.1 Population, Economy, and Employment

Table 4.9.1-1 provides a summary of selected demographic and socioeconomic conditions for affected communities within the E2W Project area. The counties affected by the E2W Project vary in population density between 389 and 1,625.8 people per square mile. The county populations range from approximately 259,088 to 650,308 (U.S. Census Bureau, 2000). The county-level civilian workforce ranges from 130,591 people (New London County, Connecticut) to 348,566 people (Norfolk County, Massachusetts).

The major occupations in the Project area are in education, health, and social services. Manufacturing and retail trade are also main industries in the area. In Massachusetts, Norfolk County had a county-wide per capita income of $32,484, which was higher than the state average of $25,952, while Bristol County had a lower county-wide per capita income of $20,978. In Connecticut, New London County had a lower county-wide per capita income of $24,678 compared to the state average of $28,766. Unemployment rates within the counties affected by the E2W Project ranged from 4.2 percent to 5.8 percent in May 2008.

TABLE 4.9.1-1

Existing Economic Conditions in the Vicinity of the HubLine/East to West Project

State/County/ Facility Name/ Municipality	Population (2000) [a]	Population Density (Persons/sq. mile, 2000) [a]	Per Capita Income (1999) [a]	Civilian Workforce (2000) [a]	Unemployment Rate, May 2008 (percent) [b]	Top Three Industries [d]
Massachusetts	6,349,097	809.8	$25,952	3,312,039	4.7	E,M,P
Norfolk County	650,308	1,625.8	$32,484	348,566	4.2	E,P,F
Bristol County	534,678	961.7	$20,978	274,768	5.8	E,M,R
I-10 Extension						
Weymouth	53,988	3,174.2	$24,976	29,590	4.6	E,R,F
Braintree	33,828	2,434.4	$28,683	17,628	4.7	E,F,R
Holbrook	10,785	1,466.7	$23,379	5,717	5.3	E,R,M
Randolph	30,963	3,075.2	$23,413	16,765	4.8	E,R,F
Avon	4,443	1,014.7	$24,410	2,319	4.9	E,R,M
Stoughton	27,149	1,692.6	$25,480	14,896	4.7	E,R,P
Canton	20,775	1,097.3	$33,510	10,934	4.2	E,P,F
Q-1 System Replacement						
Sharon	17,408	747.0	$41,323	9,130	3.9	E,P,R
Stoughton	27,149	1,692.6	$25,480	14,896	4.7	E,R,P
Canton	20,775	1,097.3	$33,510	10,934	4.2	E,P,F
Rehoboth Compressor Station						
Rehoboth	10,172	218.8	$26,467	5,813	4.8	E,M,R
Connecticut	3,405,565	702.9	$28,766	1,757,108	5.3[c]	E,M,R
New London County	259,088	389.0	$24,678	130,591	5.0[c]	E,A,M
E-3 System Replacement						
Norwich	36,117	1,274.7	$20,472	18,628	5.9 [c]	A,E,R
Preston	4,688	151.7	$24,752	2,476	4.0 [c]	E,A,M
Ledyard	14,687	385.1	$24,953	7,545	4.0 [c]	E,A,M
North Stonington	4,991	91.9	$25,815	2,849	4.4 [c]	M,A,E

[a] Source: U.S. Census Bureau, Census, 2000.

[b] Source: Massachusetts Office of Labor and Workforce Development, 2008. http://lmi2.detma.org/Lmi/town_comparison.200casp.

[c] Source: Connecticut Department of Labor, 2007. http://www.ctdol.state.ct.us/lmi/laus/lmlaus.htm.

[d] E = Education, health, and social services
F = Finance, insurance, real estate, and rental and leasing
M = Manufacturing
P = Professional, scientific, management, administrative, and waste management services
R = Retail trade
A = Arts, entertainment, recreation, accommodation, and food services

Construction of the proposed E2W Project would temporarily increase the population in the general vicinity of the Project area. Algonquin estimates that the highest concentration of workers would occur from June of 2009 through late 2009. Workforce numbers during this period would range from

approximately 100 to 840 workers. The peak workforce coincides with the construction of the proposed pipelines and the Rehoboth Compressor Station. Construction of the Rehoboth Compressor Station and the modifications at the existing compressor stations is expected to occur between June and November of 2009. Table 4.9.1-2 lists the size of the estimated construction workforce for the E2W Project. Algonquin anticipates two construction spreads, consisting of 225 workers each, for construction of the I-10 Extension and Q-1 System Replacement in Massachusetts. Algonquin anticipates one construction spread consisting of 170 workers for construction of the E-3 System Replacement in Connecticut. Algonquin anticipates one construction spread consisting of 100 workers at the Rehoboth Compressor Station in Massachusetts. A total of 100 workers would be required for the additional compressor station modifications. Once the pipelines and the compressor stations are completed, the workforce numbers would decrease substantially.

TABLE 4.9.1-2

Construction Schedule and Estimated Workforce for the HubLine/East to West Project

				Construction	
Pipeline Facilities	Start MP	End MP	Length	Year	Personnel
I-10 Extension	0.0	12.9	12.9	2009	+/- 225
Q-1 System Replacement	12.2	19.7	7.5	2009	+/- 225
E-3 System Replacement	0.0	11.0	11.0	2009	+/- 170
Aboveground Facilities					
Rehoboth Compressor Station	16.8 [a]	[a]	[a]	2009	+/- 100
Existing Compressor Station Modifications	[a]	[a]	[a]	2009	+/- 100

[a] The Rehoboth Compressor Station would be located near Algonquin's G-5 tap at about MP 16.8 on the G-1 system; the existing compressor stations are located along Algonquin's existing system.

The construction workforce would include both local and non-local workers. Algonquin anticipates hiring a substantial number of local construction workers with the requisite experience for the installation of natural gas facilities. These local hires would include surveyors, welders, equipment operators, and general laborers. Approximately 40 to 50 percent of the construction workers (about 336 to 420 workers at peak) are expected to be local hires. The local supply of construction workers needed for the E2W Project is expected to be derived from workers employed in the construction industry in Massachusetts and Connecticut. Additional construction personnel hired from outside the Project area would include supervisory personnel and inspectors who would temporarily relocate to the Project area. If a larger than anticipated percentage of non-local workers is required to meet peak workforce requirements, sufficient workers should be available in the labor pool in the surrounding counties and states.

Project-area population impacts are expected to be temporary and proportionally small. The total population change would equal the total number of non-local construction workers, plus any family members accompanying them. Given the brief construction period, most non-local workers are not expected to be accompanied by their families. Assuming 60 percent of the total construction workforce is non-local (504 workers) and relocate to the Project area with family members, the population in the Project area would increase by approximately 1,305 people, based on a typical household size of 2.59 persons (U.S. Census Bureau, 2000). Given the county populations within the Project area (259,088 to 650,308), the addition of 1,305 people would result in less than a 1 percent change. Additionally, this temporary increase in population would be distributed throughout the 31.4 mile-long area along the I-10 Extension, the Q-1 System Replacement, and the E-3 System Replacement, and would not have a

permanent impact on the population. A brief decrease in the unemployment rate could occur as a result of hiring local workers for construction and increased demands on the local economy.

4.9.2 Housing

Housing statistics for the counties affected by the proposed Project are presented in table 4.9.2-1. In 2000, Norfolk County had 6,327 vacant housing units with a rental vacancy rate of 2.5 percent. Bristol County had 11,507 vacant housing units with a rental vacancy rate of 5.5 percent. In 2000, New London County had 10,839 vacant housing units with rental vacancy rates of 6.4 percent.

Temporary housing availability varies seasonally and geographically within the counties and communities near the proposed facilities. Temporary housing is available in the form of daily, weekly, and monthly rentals in motels, hotels, campgrounds, and recreational vehicle parks. The demand for temporary housing in the Project area is generally greatest during the summer months when tourism is at its highest. Table 4.9.2-1 provides the vacant housing units and median monthly housing costs along with number of hotels/motels in the towns closest to the proposed facilities. Other available temporary housing such as bed and breakfast facilities, apartments, and vacation properties, as well as those in other towns/cities within commuting distance of the Project area (e.g., Providence, Rhode Island and Boston, Massachusetts) are not included. Therefore, the availability of temporary housing is substantially greater than presented in table 4.9.2-1.

TABLE 4.9.2-1

Housing Statistics by County in the Vicinity of the HubLine/East to West Project

State/County	Owner occupied (percent)	Renter occupied (percent)	Median Monthly Housing Costs [a]	For Seasonal or Occasional Use [b, c]	Vacant Housing Units [b]	Rental Vacancy Rate (percent)	Number of Hotels/ Motels [d]
Massachusetts	1,508,052 [a]	935,528[a]	933	93,771	178,409	5.7 [e]	N/A[f]
Norfolk County	173,413 [c]	75,414[c]	788	75,485 rental units, 1,161 additional seasonal	6,327	2.5 [d]	33
Bristol County	126,531 [c]	78,880[c]	423	2,038	11,507	5.5 [d]	26
Connecticut	921,382 [a]	404,06 [a]	886	23,517	106,807	8.0 [e]	N/A[f]
New London County	66,548 [d]	33,287 [d]	562	33,273 rental units, 5,236 additional seasonal	10,839	6.4 [d]	39

Source:

[a] U.S. Census Bureau, 2006 American Community Survey.

[b] Source: U.S. Census Bureau, Census 2000.

[c] Seasonal housing units are those intended for occupancy only during certain seasons of the year and are found primarily in resort areas. Housing units held for occupancy by migratory labor employed in farm work during the crop season are tabulated as seasonal. As of the first quarter 1986 vacant seasonal mobile homes are being counted as a part of the seasonal housing inventory. U.S. Census Bureau, 2000.

[d] E-podunk. 2007. http://www.epodunk.com/.

[e] U.S. Census Bureau, Housing and Household Economic Statistics Division February 20, 2008.

[f] The number of hotels/motels on a state level is highly variable and not applicable for this Project.

Construction of the proposed E2W Project could affect the availability of housing in the Project area. The E2W Project is expected to have a short-term positive impact on the area rental industry through increased demand and higher rates of occupancy; however, no significant impacts on the local

housing markets are expected. Assuming that the local construction workers do not require housing, a total of 504 housing units for non-local workers may be required during peak construction activities. Given the vacancy rates (2.5 percent to 6.4 percent), the number of rental housing units in the area, hotel/ motel rooms, and campgrounds available in the cities and towns, construction crews should not encounter difficulty in finding temporary housing. While construction activities may occur during the peak tourism season, temporary housing is likely to be available, but may be more difficult to find, and/or more expensive to secure.

4.9.3 Public Services

A wide range of public services and facilities are offered in Norfolk, Bristol, and New London Counties. Services and facilities include hospitals, full-service law enforcement, paid and volunteer fire departments, and schools. Each municipality in the socioeconomic impact area has its own local police department and fire department. Each of the three counties also has a Sheriff's department. In addition, each municipality has an independent school district operating its own public school system with the exception of a few regional schools. Table 4.9.3-1 provides an overview of selected public services available in the larger cities in the vicinity of the Project area.

The influx of non-local workers and associated family members (1,305 people) would be small relative to the current populations in Norfolk County (650,308), Bristol County (534,678), and New London County (259,088). This would result in minor, temporary, or no impact on local community facilities and services, such as police, fire, and medical services. The counties, cities, and towns in the Project vicinity presently have adequate infrastructure and services to meet the needs of the non-local workers and family members.

Short-term impacts on public services could include the need for localized police assistance to control traffic flow during construction activities. Also, construction-related injuries could occur as a result of unanticipated accidents or emergencies. Algonquin would require its contractors to have a Health and Safety Plan in place to minimize the potential for on-the-job accidents. In the event of an accident, Algonquin could require police, fire, and medical services, depending on the type of emergency. The anticipated demand for police, fire, and medical services is not expected to exceed the existing capability of the infrastructure in the Project area to provide them, as these services are expected to be used only in emergencies. These emergency services are located at reasonable distances from the E2W Project area. For example, Sturdy Memorial Hospital and the Southcoast Hospital Group are both located within 8.0 miles of the Town of Rehoboth. In addition, hospitals such as South Shore Hospital, Brockton Hospital, Faulkner Hospital, and Caritas Norwood Hospital in the immediate vicinity of the I-10 Extension and the Q-1 System Replacement supplement the medical facilities located in the downtown Boston area. Algonquin would continue to work with police, fire, and medical services in each municipality as necessary.

Primary impacts on public services would also include temporary increases in demand for retail, recreation, and related services. Additionally, the education infrastructure in the vicinity of the Project can easily accommodate any temporary and minimal educational needs associated with the construction of the E2W Project.

TABLE 4.9.3-1

Public Service Infrastructure for the HubLine/East to West Project

State/County/ Municipality	Fire Department (type)	Number of Fire Stations [a]	Number of Public Schools	Police Contact Information	Number Hospitals [b]
Massachusetts					
Norfolk County				Norfolk County Sheriffs Office (781)329-3705	13
Avon	Avon Fire Department (mostly volunteer)	1	2	Avon Police Department (508)583-6677	
Braintree	Braintree Fire Department (career)	3	9	Braintree Police Department (781)794-8600	
Canton	Canton Fire Department (mostly career)	2	8	Canton Police Department (781)821-5090	
Holbrook	Holbrook Fire Department (mostly career)	2	3	Holbrook Police Department (781)767-1212	
Randolph	Randolph Fire Department (mostly career)	2	6	Randolph Police Department (781)963-1212	
Sharon	Town of Sharon Fire Department (mostly career)	1	5	Sharon Police Department (781)784-1587	
Stoughton	Stoughton Fire/Rescue (career)	2	8	Stoughton Police Department (781)344-2424	
Weymouth	Weymouth Fire Department (career)	4	12	Weymouth Police Department (781)335-1212	
Bristol County				Bristol County Sheriff's Office (508)995-6400	10
Rehoboth	Rehoboth Fire Department (mostly volunteer)	3	2	Rehoboth Fire Department (508)252-3722	
Connecticut					
New London County				New London County Sheriff Department (860)443-5400	2
Norwich	City of Norwich Fire Department (career)	2	11	Norwich Police Department (860)886-5561	
Preston	Preston City Volunteer Fire Department (volunteer)	1	2	North Stonington Police Department (860)535-1451	
Ledyard	Ledyard Fire Company, District No. 1, Inc. (mostly volunteer)	1	6	Ledyard Police Department (860)464-8225	
North Stonington	North Stonington Volunteer Fire Department (volunteer)	1	3	Preston Police Department (860)887-8232	

Source:
[a] Massachusetts Sheriff's Departments. http://www.policeemployment.com/sheriff/ma/.
[b] U.S. Census Bureau. AmericanFactFinder. http://factfinder.census.gov/servlet/IBQTable?_bm=y&-ds_name=EC0262A1&-geo_id=05000US25005&-geo_id=05000US25021&-search_results=01000US&-dataitem=*&-_lang=en.

Three permanent employees would be required for operation and maintenance of the proposed Project at a total annual labor cost of $400,000. Additionally, Algonquin plans on relocating employees currently working at its Dighton office to the Rehoboth Compressor Station for a total of 13 permanent employees. This total number of permanent employees would minimally impact existing public infrastructure and community services. Algonquin anticipates that water and sanitary waste disposal

needs would be addressed by the on-site potable water wells and septic systems of the Project. Therefore, with regard to these utilities, the facility is expected to be self-sufficient. Any minimal impacts on public services associated with the operation of the E2W Project facilities would be adequately offset by the revenues accruing to state and local governments from Project operation. Specifically, the host community of Rehoboth can expect to realize in excess of $300,000 annually in additional tax revenues associated with the new compressor station, with minimal impact on community services. Communities along the I-10 Extension should experience an average of $30,000 to $50,000 per linear mile in ad valorem taxes on an annual basis.

4.9.4 Transportation and Traffic

The local road and highway system in the vicinity of the proposed Project facilities is readily accessible by interstate highways, U.S. highways, state highways, secondary state highways, county roads, and private roads. The principal north-south roadway is Interstate 95 and the principal east-west roadway is Interstate 90. Most local public roads in the vicinity of the proposed Project are paved. Construction of the proposed Project could result in minor, short-term impacts along some roads and highways due to the movement and delivery of equipment and materials. To the extent feasible, existing public and private road crossings along the proposed pipeline routes would be used as the primary means of accessing the right-of-way. Algonquin proposes to use 42 access roads during construction, of which 38 are existing roads as discussed in section 2.2.4 and listed in table 2.2.4-1. In Massachusetts, 16 access roads would be used along the I-10 Extension and 10 access roads would be used along the Q-1 System Replacement. In Connecticut, 15 access roads would be used along the E-3 System Replacement. Algonquin would also construct three new roads along the Q-1 System Replacement and one permanent paved access road to the Rehoboth Compressor Station (see section 2.2.4).

The E2W Project would cross 47 public roads and 5 railroads in Massachusetts and 20 public roads and 1 railroad in Connecticut. These roads and railroads are listed in table 4.9.4-1 along with the proposed construction method. Figures 4.9.4-1 and 4.9.4-2 show the state highways that would be crossed in Massachusetts and Connecticut. The majority of the public roads would be crossed using either the conventional open-cut or road bore method depending on permit conditions. Two railroads and one public road would be crossed using the HDD method. These crossing methods are described in section 2.3.2. Road crossing permits would be obtained from applicable state and local agencies. Permit conditions would ultimately dictate the day-to-day construction activities at road crossings.

To minimize traffic delays at open-cut road crossings, Algonquin would establish detours before cutting these roads. If no reasonable detours are feasible, at least one traffic lane of the road would be left open, except for brief periods when road closure would be required to lay the pipeline. Appropriate traffic management and signage would be set up and necessary safety measures would be developed in compliance with applicable permits for work in the public roadway. Algonquin would make arrangements with local officials to have traffic safety personnel present during periods of construction.

The daily commuting of the construction workforce to the Project area could also temporarily affect traffic and create roadside parking hazards. Algonquin estimates that a maximum of 235 people would be working on any one pipeline route at any one time and that a maximum of 100 people would be working at the Rehoboth Compressor Station at any one time. To minimize potential effects on traffic associated with these workers, Algonquin would encourage construction workers to share rides to the construction right-of-way. Contractors may also provide buses to move workers from common parking areas to the construction work area. Algonquin would schedule construction work within roadways and specific crossings to avoid commuter traffic and school buses to the greatest extent practical.

TABLE 4.9.4-1

Public Roads and Railroads Crossed by the HubLine/East to West Project [a]

State/Facility/ Milepost	Roadway Name Facility	Road Surface	Municipality	Proposed Construction Method
Massachusetts				
I-10 Extension				
1.0	MBTA Railroad	Railroad	Weymouth	HDD
1.1	Commercial Street	Asphalt	Weymouth	HDD
1.6	Broad Street	Asphalt	Weymouth	Bore
2.3	State Route 53 (Washington Street)	Asphalt	Weymouth	Bore
2.8	Main Street	Asphalt	Weymouth	Bore
2.9	Front Street	Asphalt	Weymouth	Bore
3.3	State Route 3 (Southeast Expressway)	Asphalt	Weymouth	Bore
3.8	Summer Street	Asphalt	Weymouth	Bore
4.3	Commerce Drive	Asphalt	Braintree	Bore
4.3	MBTA Railroad	Railroad	Braintree	Bore
4.4	Grove Street	Asphalt	Braintree	Bore
4.4	Columbian Street	Asphalt	Braintree	Bore
5.0	Teaberry Lane	Asphalt	Braintree	Bore
5.2	Devon Woods Drive	Asphalt	Braintree	Bore
6.5	Pine Street	Asphalt	Holbrook	Bore
6.7	Damon Avenue	Asphalt	Holbrook	Bore
6.8	North Franklin Street	Asphalt	Holbrook	Bore
7.5	Westdale Avenue [b]	Asphalt	Holbrook	Open Cut
7.7	Scott Street	Asphalt	Holbrook	Bore
7.8	Centre Street	Asphalt	Holbrook	Bore
7.9	MBTA Railroad	Railroad	Holbrook/Randolph	Bore
7.90	Mill Street	Asphalt	Randolph	Open Cut
8.0	Wyman Road	Asphalt	Randolph	Open Cut
8.1	State Route 139 (Union Street)	Asphalt	Randolph	Bore
8.2	Boothbay Circle	Asphalt	Randolph	Open Cut
8.40	South Street	Asphalt	Randolph	Bore
8.9	South Main Street	Asphalt	Randolph	Bore
9.0	Highland Avenue	Asphalt	Randolph	Open Cut
9.4	Fitch Terrace	Asphalt	Randolph	Open Cut
10.3	State Route 24 N (Amvets Memorial Highway)	Asphalt	Stoughton	Bore
10.3	State Route 24 S (Amvets Memorial Highway)	Asphalt	Stoughton	Bore
10.4	Page Street	Asphalt	Stoughton	Open Cut
10.4	Old Page Street	Asphalt	Stoughton	Open Cut
10.6	Maple Street	Asphalt	Stoughton	Open Cut
10.8	Turnpike Street / Hwy 139	Asphalt	Stoughton	Bore
12.4	Indian Lane	Asphalt	Canton	Open Cut
Q-1 System Replacement				
13.5	Moose Hill Street	Asphalt	Sharon	Open Cut
14.5	State Route 27 (Norwood Street)	Asphalt	Sharon	Bore
14.6	Fales Road	Asphalt	Sharon	Open Cut
14.8	Bullard Street	Asphalt	Sharon	Open Cut
15.3	Richards Avenue	Asphalt	Sharon	Open Cut
15.4	Saw Mill Pond Road	Asphalt	Sharon	Open Cut
15.4	Canton Road	Asphalt	Sharon	Open Cut

TABLE 4.9.4-1 (cont'd)

Public Roads and Railroads Crossed by the HubLine/East to West Project [a]

State/Facility/ Milepost	Roadway Name Facility	Road Surface	Municipality	Proposed Construction Method
15.6	MBTA Railroad	Railroad	Sharon	Bore
16.7	Washington Street	Asphalt	Canton	Bore
17.4	Greenbrook Drive	Asphalt	Stoughton	Open Cut
17.6	Pine Street	Asphalt	Canton/Stoughton	Bore
17.9	Operating Engineer Road	Asphalt	Canton	Open Cut
18.0	New York / New Haven Railroad	Railroad	Canton	Bore
18.5	Pleasant Street	Asphalt	Canton	Open Cut
19.2	John Road	Asphalt	Canton	Open Cut
19.4	Turnpike Street	Asphalt	Canton	Bore
Connecticut				
E-3 System Replacement				
0.2	Plain Hill Road	Asphalt	Norwich	Open Cut
0.4	Bog Meadow Road	Asphalt	Norwich	Open Cut
0.6	Interstate 395 (Connecticut Turnpike)	Asphalt	Norwich	Bore
0.7	Case Street	Asphalt	Norwich	Open Cut
1.2	Scotland Road	Asphalt	Norwich	Open Cut
1.4	Reservoir Road	Asphalt	Norwich	Open Cut
1.6	Canterbury Turnpike	Asphalt	Norwich	Bore
1.8	Beebe Road	Asphalt	Norwich	Open Cut
1.8	Harland Road	Asphalt	Norwich	Open Cut
2.5	Mohegan Park	Asphalt	Norwich	Bore
2.6	Little Valley Court	Asphalt	Norwich	Open Cut
3.3	State Route 12 (Boswell Avenue)	Asphalt	Norwich	Bore
3.5	Providence and Worcester Railroad	Railroad	Norwich	HDD
4.4	Roosevelt Avenue Ext.	Asphalt	Preston	Open Cut
4.8	Old Jewett City Road	Asphalt	Preston	Open Cut
5.3	Shetucket Turnpike	Asphalt	Preston	Bore
5.6	Miller Road	Asphalt	Preston	Open Cut
7.3	Branch Hill Road	Asphalt	Preston	Open Cut
7.9	Ross Road	Asphalt	Preston	Open Cut
8.4	State Route 164	Asphalt	Preston	Bore
9.4	Watson Road	Asphalt	Preston	Open Cut

[a] Does not include public roadways that have never been developed or have been abandoned and are no longer used but are depicted on the Project alignment sheets based solely on tax map data.

[b] Road is currently dirt as shown on alignment sheets but is planned for construction and would be paved.

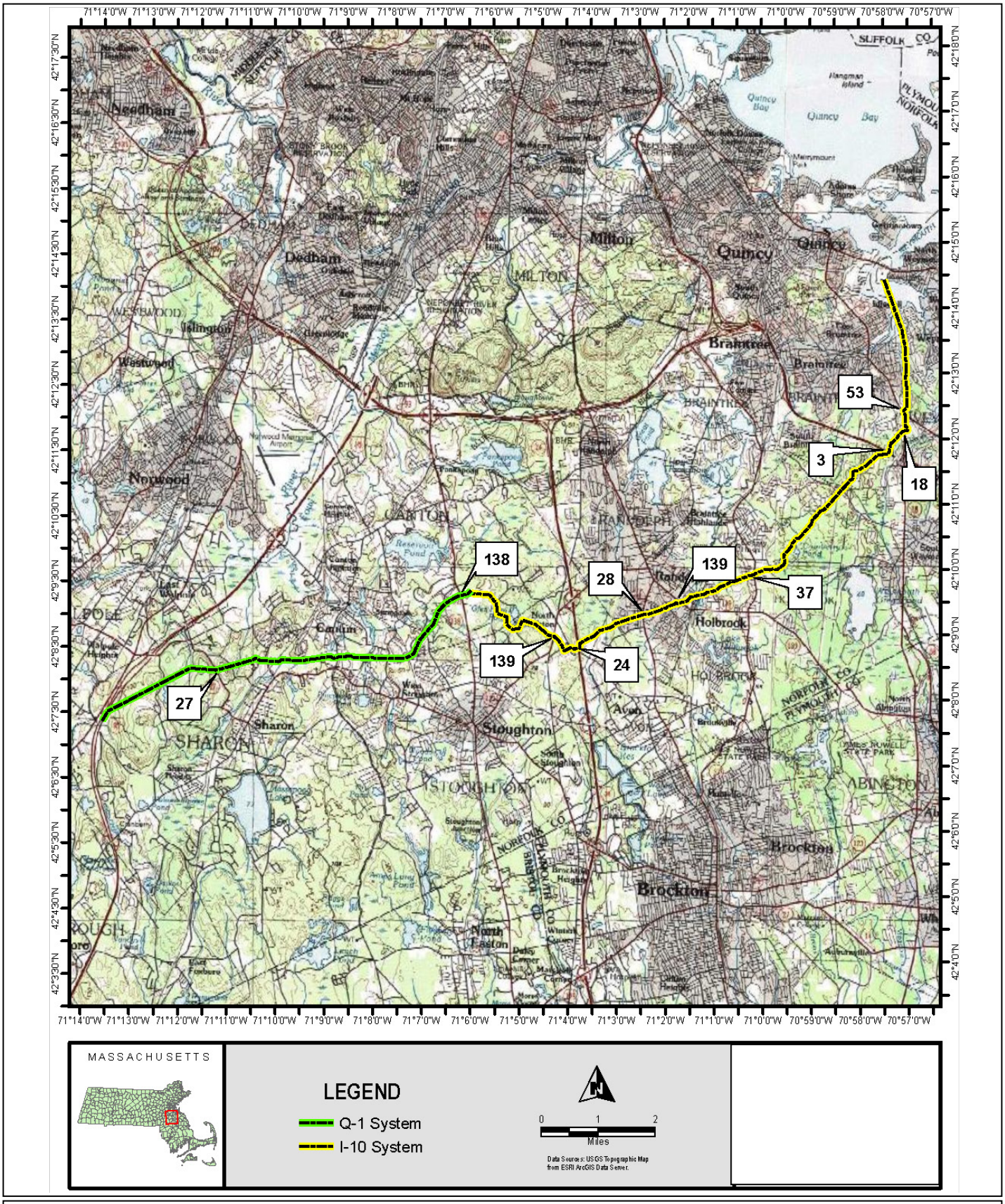

Figure 4.9.4-1
HubLine/East to West Project
State Highway Crossings in Massachusetts

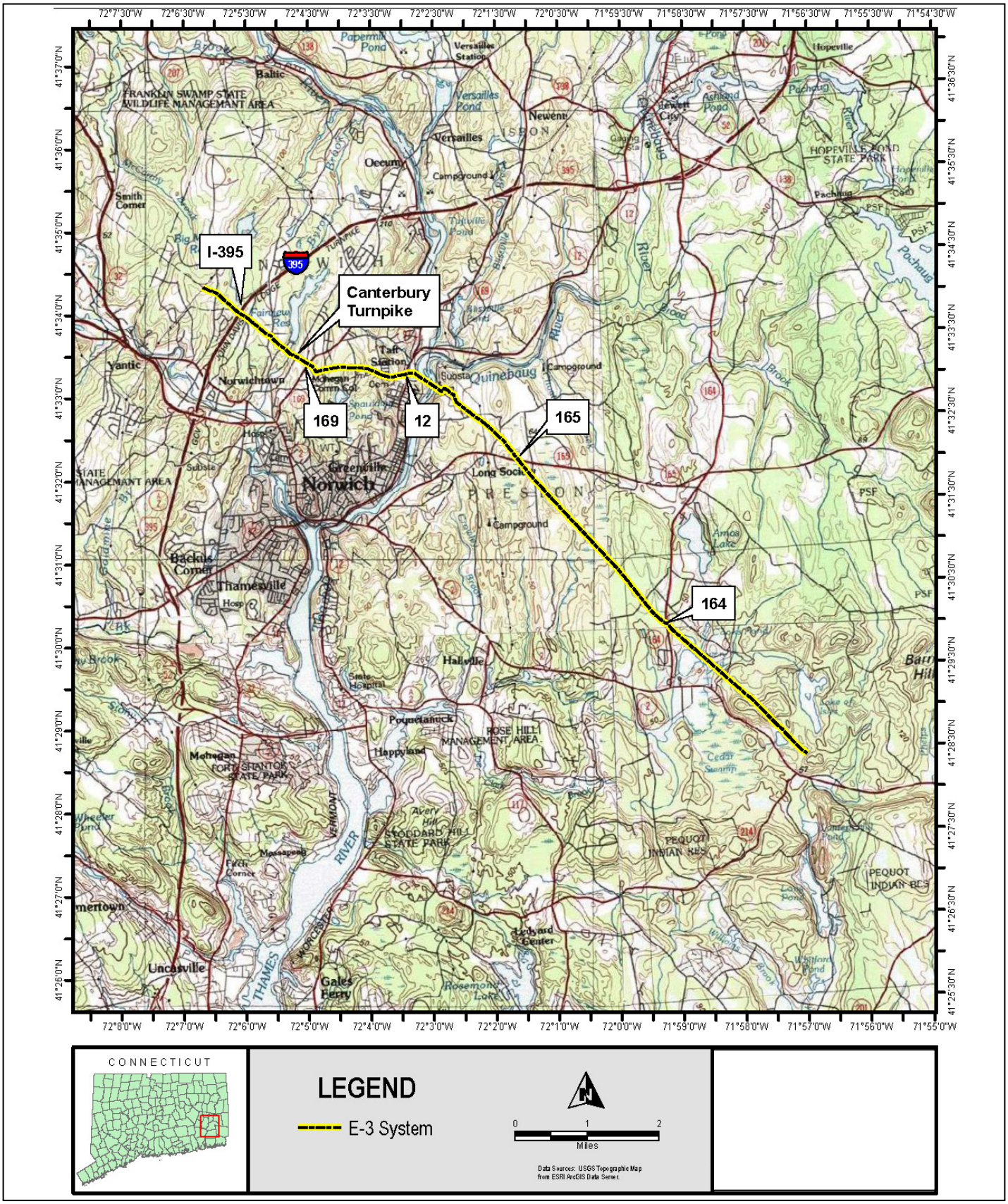

Figure 4.9.4-2
HubLine/East to West Project
State Highway Crossings in Connecticut

Because pipeline construction work is generally scheduled to take advantage of daylight hours, workers would commute to and from the pipe storage and contractor ware yards, and/or compressor stations during off-peak hours (e.g., before 7:00 a.m. and after 6:00 p.m.). Additionally, construction would move sequentially along the proposed pipeline routes; therefore, traffic flow impacts would be temporary on any given section of roadway.

In addition to the construction workforce, the delivery of construction equipment and materials to the construction work area could temporarily congest existing transportation networks at specific locations. At this time, Algonquin has identified six pipe storage and contractor ware yards. The construction equipment is typically staged at a pipe storage or contractor ware yard and then transported to the construction right-of-way. Several construction-related trips would be made each day between the construction areas and the yards. These areas would be located approximately 2.0 miles from the I-10 Extension and the Q-1 System Replacement and approximately 1.0 mile from the E-3 System Replacement. Once a vehicle leaves the pipe storage or contractor ware yard, its exact route would vary depending on the current location of construction activity. Equipment would be dropped off in one location and would then move in a linear direction along the right-of-way. As a result, most equipment would be located on the pipeline right-of-way and would not significantly affect traffic on local roads after its initial delivery.

Algonquin and its contractors would comply with local weight restrictions and limits, and would keep roads free of soil that may be deposited by construction equipment. When necessary for equipment to cross roads, mats or other appropriate measures (e.g., sweeping) would be used to reduce deposition of mud. The surfaces of roadways in the general area are not expected to be affected by heavy equipment because such equipment would be restricted to off-roadway operation once it reaches the E2W Project area. The need for road detours and traffic control measures associated with the movement of large construction vehicles may temporarily increase the work load of county law enforcement.

The relatively small number of permanent workers required for operation and maintenance of the proposed facilities should result in negligible long-term impacts on the transportation infrastructure.

4.9.5 Agriculture

Project construction and operation would result in the temporary disturbance of 8.3 acres of agricultural land (i.e., cultivated fields and hayfields) and permanent disturbance of 1.1 acres (see section 4.8.1). No areas currently in commercial timber production would be affected.

Algonquin would negotiate just compensation for loss of crop and timber production with each affected landowner and would conduct post-construction monitoring of crossed agricultural lands to identify areas that might need additional restoration in accordance with its E&SCP.

4.9.6 Property Values

Comments were received during the scoping process regarding property devaluation and increases in insurance rates associated with the proposed Project. It is not anticipated that the E2W Project would negatively impact any property values outside the proposed pipeline right-of-way or compressor station boundaries. Landowners who feel that their property values have been negatively impacted can appeal to the local tax agency for reappraisal and reduction of taxes.

In 2001, Allen, Williford & Seale, Inc. prepared a study for the Interstate Natural Gas Association of America Foundation, Inc. to determine the impact of natural gas pipelines on real estate. Four separate geographically diverse areas were selected for the case study: 1) a suburban area crossed by one natural

gas pipeline; 2) a suburban area crossed by multiple natural gas and products pipelines; 3) a rural area crossed by one natural gas pipeline; and 4) a rural area crossed by multiple natural gas pipelines and one products pipeline. The results of the study revealed that there is no significant impact on property sales located along natural gas pipelines and that the pipeline size or the product carried did not impact the sale price. The study also revealed that there were no significant impacts on demand for properties within the geographically diverse areas and that the presence of a pipeline did not impede development of the surrounding properties. In addition, the existence of a pipeline had no significant impact on development decisions (e.g., lot size) and it did not impact specific property types more or less severely than other property types (Allen, Williford & Seale, Inc., 2001).

We are not aware of any situations where property owners' insurance rates have increased as a result of the location or proximity of aboveground or belowground high pressure natural gas pipeline facilities, nor are we aware of any situation where a landowner's ability to obtain insurance was affected.

4.9.7 Tax Revenues

Construction and operation of the Project would have beneficial impacts on local sales tax revenue. Table 4.9.7-1 provides the estimated payroll, cost of materials purchased locally, and sales tax revenues associated with construction of the E2W Project. Payroll taxes would also be collected from the workers employed on the Project. Algonquin anticipates that the total payroll for the Project would be approximately $137 million during the construction phase. Construction payroll would be approximately $98 million in Massachusetts and $19 million in Connecticut.

TABLE 4.9.7-1

Socioeconomic Impact Resulting from Construction and Operation of the HubLine/East to West Project

	Construction			Operation
State	Construction Payroll (Total)	Cost of Materials Purchased (Total)	Gross Plant Taxes (annual)	Ad Valorem (2009-2018)
Massachusetts	98,539,000	38,395,000	319,707,000	41,756,761
Connecticut	19,055,000	4,088,000	52,165,000	10,732,627
Additional Modifications and Construction Areas	11,745,699	13,125,000	8,071,000	741,296
Total	129,339,699	55,608,000	379,943,000	53,230,684

These activities would temporarily increase the tax revenue for the states. Three permanent employees would be required for operation and maintenance of the E2W Project facilities at a total annual labor cost of $400,000. Project operation and maintenance activities would result in long-term employment benefits for three employees as well as substantial long-term benefits from an estimated $750,000 to $1,250,000 in annual property taxes. Communities along the I-10 Extension should experience an average of $30,000 to $50,000 per linear mile in ad valorem taxes on an annual basis. Algonquin estimates that the E2W Project would contribute approximately $53 million in ad valorem taxes (2009 to 2018) among the various counties affected by the Project. The amount paid to each county would be determined by the value of the facilities within each individual county and corresponding tax rates. Rehoboth should experience an excess of $300,000 annually in additional tax revenues associated with the new compressor station.

Project construction would result in short-term, beneficial impacts in terms of increased payroll and local material purchases. Because about 40 to 50 percent of the workers are expected to be local, and non-local workers would temporarily relocate to the Project vicinity, a substantial portion of the payroll would be spent with local vendors and businesses. Algonquin estimates that some additional money

would be spent locally on the purchase of equipment and materials. While most of the materials for E2W Project construction would be purchased from national vendors, common supplies (e.g., stone and concrete) would be purchased, as available, from vendors within Norfolk and Bristol Counties, Massachusetts and New London County, Connecticut. Construction of the E2W Project would also result in increased state and local sales tax revenues associated with the purchase of some construction materials as well as goods and services by the construction workforce. The approximate cost of materials is $55.6 million.

4.9.8 NSTAR Alternative

Construction of the NSTAR Alternative would not change the total time required for construction of the proposed facilities and would not result in additional impacts on the existing population or local economy, public services, or housing. The NSTAR Alternative would affect the same socioeconomic area (towns and counties) as the proposed route; therefore, the socioeconomic impacts would be unlikely to change. During the scoping period, numerous comment letters were submitted expressing concern about the proximity of the NSTAR Alternative, which was originally part of the proposed route, to the New England Sinai Hospital and the Dawe Elementary School. The hospital and school are located 700 feet and 300 feet from the NSTAR Alternative, respectively. Operation of the NSTAR Alternative would not substantially alter the potential effects of the E2W Project on socioeconomics.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA (16 USC 470) requires that federal agencies take into account the effects of their undertakings (including the issuance of Certificates) on properties listed on or eligible for listing on the National Register of Historic Places (NRHP) and to provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Algonquin, as our non-federal representative, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 CFR Part 800.

4.10.1 Cultural Resources Surveys

4.10.1.1 Survey Methodology

Where surveys were required, Algonquin conducted a site file search and literature review to identify previously recorded cultural resources within 1 mile of the proposed Project. Algonquin conducted a survey for standing structures and architectural resources along a 1,000-foot-wide corridor centered on the proposed pipeline centerline and within 0.5 mile of the proposed Rehoboth Compressor Station. The survey corridor for archaeological sites was 200 feet wide centered on the proposed pipeline centerline, including associated aboveground facilities and temporary extra workspaces. The survey corridor for access roads was 25 feet wide. Algonquin also surveyed pipe storage and contractor ware yards.

4.10.1.2 Rhode Island

The Rhode Island State Historic Preservation Office (SHPO) recommended that the proposed modifications to the existing Burrillville Compressor Station in Providence County would have no effect on historic properties and no cultural resources survey would be required. We concur.

4.10.1.3 New Jersey

The New Jersey SHPO recommended that the proposed modifications to the existing Hanover Compressor Station in Morris County would have no effect on historic properties and no cultural resources surveys would be required. We concur.

4.10.1.4 Massachusetts

Aboveground Resources

The I-10 Extension – A total of 199 aboveground resources were identified within the pipeline route indirect area of potential effect (APE). One hundred eighty-eight of the properties have been recommended not eligible for listing on the NRHP and no further work is recommended. The remaining 11 properties have been recommended as potentially eligible for listing on the NRHP (see table 4.10.1-1). Algonquin recommended that the Project would have no effect on these properties and recommended that no further work is required.

The Massachusetts Historical Commission (MHC) commented that the Project would have no adverse effect on the 11 potentially eligible properties; however, it recommended that maintenance of existing vegetation or planting supplemental vegetation would assist in reducing the visual effects of the Project on three of the potentially eligible resources. We concur.

TABLE 4.10.1-1

Architectural Properties Along the I-10 Extension Recommended Potentially Eligible for Listing on the National Register of Historic Places

Name/Location/Site Number	Description	MHC Comments
North Franklin Street Area, Holbrook (MHC No. HLB.F)	Part of a north-south Colonial-period route through Holbrook, North Franklin Street is lined with a relatively intact collection of Georgian-, Federal-, Greek Revival-, Italianate-, Queen Anne-, and Colonial Revival-style residential buildings.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Oscar B. Wilde House, Holbrook (HLB.178)	Two-story, three-bay-wide Colonial Revival-style residence constructed in 1913.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Captain Nathaniel Belcher House, Holbrook (HLB.177)	One-and-one-half-story, five-bay by four-bay Georgian Cape constructed in 1754 as a residence and stagecoach line tavern.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Unnamed 19th century residence, Stoughton (number not assigned)	A ca. 1850 Greek Revival-style residence, one-and-one-half-story structure.	No adverse effect; not within the visual area of potential effect (APE).
Ebenezer Thayer House, Randolph (RAN.17-318)	1770 Colonial residence and ca. 1900 detached garage.	No adverse effect; not within the visual APE.
Randolph District No. 1 Schoolhouse, Randolph (RAN.35-254)	1790 former schoolhouse converted to residential use.	No adverse effect; not within the visual APE.
Unnamed residence, Weymouth (WEY.112-417)	Two-story, five-bay by three-bay Georgian/Federal residence constructed in 1800 with detached carriage house.	No adverse effect; not within the visual APE.
L.G. Hollis and Alfred James House, Weymouth (WEY.417)	One-and-one-half-story, three-bay by four-bay Greek Revival-style residence.	No adverse effect; not within the visual APE.
Reed Cemetery, Weymouth (WEY.804)	Heavily wooded and overgrown cemetery with upright stone markers, initially dating to 1769 through 1949.	No adverse effect; is not within the visual APE.
Unnamed residence, Weymouth (number not assigned)	One-and one-half-story, 1820 Half Cape.	No adverse effect; not within the visual APE.
Unnamed residence, Weymouth (number not assigned)	Two-and-one-half-story, 1850 Greek Revival-style residence and detached English barn.	No adverse effect; not within the visual APE.

The Q-1 System Replacement – A total of 29 aboveground resources were inventoried within the pipeline route indirect APE. Twenty-four of the properties have been recommended not eligible for listing on the NRHP and no further work is recommended. The remaining five properties have been recommended as potentially eligible for listing on the NRHP (see table 4.10.1-2). Algonquin recommended that the Project would have no effect on these properties and recommended that no further work is required.

The MHC recommended that the Belcher Double House is not eligible for listing on the NRHP due to lack of integrity and its compromised contemporary setting. The MHC also commented that the Project would have no adverse effect on the remaining four properties and that maintenance of existing vegetation or planting supplemental vegetation would help reduce the visual effect of the Project on three of the four NRHP-eligible properties (see table 4.10.1-2). We concur.

TABLE 4.10.1-2 **Architectural Properties Along the Q-1 System Replacement Recommended Potentially Eligible for Listing on the National Register of Historic Places**		
Name/Location/Site Number	Description	MHC Comments
Chestnut Tree Burial Ground, Sharon (MHC No. SHA.810)	An early-18th century cemetery with more than 500 gravestones dating from 1733 to the present, including 21 from the Revolutionary War.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Belcher Double House, Canton (MHC No. CAN.220)	A one-story rectangular wood frame double house, ca 1840.	No adverse effect; not NRHP eligible.
J. Billings House/Wilbur Farm, Sharon (MHC No. SHA.32)	Federal-style ca. 1800 residence, two-and-one-half-story, five-bay by two-bay with side-gabled roof, gable returns, two brick chimneys, and granite foundation.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Moose Hill Wildlife Sanctuary, Sharon (number not assigned)	Former agricultural complex consisting of a ca. 1900 two-and-one-half-story, five-bay by two-bay vernacular.	No adverse effect; suggest further reduction of visual effects with vegetation plan.
Unnamed residence, Sharon (number not assigned)	Federal-style ca. 1850 residence and detached barn.	No adverse effect; not within the visual area of potential effect.

Rehoboth Compressor Station – Ten aboveground resources were located within the indirect APE. Four resources were recommended potentially eligible for listing on the NRHP: the Benjamin Bowen House; the Captain E. Wimarth House; the Short/Carpenter Double House; and Carpenter Street cut stone marker. Algonquin recommended that the Project would have no effect on these properties because none would have any views of the compressor station. The remaining six properties were recommended as not eligible for listing on the NRHP and no further work is recommended. The MHC agreed with these recommendations. We concur.

Archaeological Sites

The I-10 Extension – A total of 19 archaeological sites and 5 historic-period stone walls were located along the I-10 Extension route. Fourteen of the sites were recommended as not eligible for listing on the NRHP and no further work is recommended. One site was recommended as eligible for listing on the NRHP; however, the site was subsequently destroyed by the landowner and no further work is recommended. The remaining four sites are recommended as potentially eligible for listing on the NRHP and additional evaluations are recommended. The MHC agreed with these recommendations and we concur. Additional discussion of historic-period stone walls is provided below.

The Q-1 System Replacement – Six archaeological sites were located along the Q-1 System Replacement route. These sites were recommended as not eligible for listing on the NRHP and no further work is recommended. The MHC agreed with these recommendations and we concur.

Rehoboth Compressor Station – One isolated find was located during surveys and was recommended as not eligible for listing on the NRHP. No further work is recommended at the Rehoboth Compressor Station site. The MHC agreed with these recommendations and we concur.

Stone Wall Surveys – Algonquin submitted a Stone Wall Survey and Restoration Plan for the I-10 Extension, Q-1 System Replacement, and Rehoboth Compressor Station facilities to the MHC. The document provides an inventory of all stone walls that would be intersected and potentially impacted by the proposed pipelines or Rehoboth Compressor Station, photographs of all of the stone walls, and a plan for restoration of each wall regardless of any formal NRHP designation. The MHC recommended that

construction specifications include the stone wall restoration plan, and that post-construction inspection reports be provided to the MHC and the FERC.

Local Historical Commissions Consultation

Between March and May 2008, Algonquin consulted with 10 local historical commissions in Massachusetts to provide them an opportunity to comment on the proposed Project. The local historical commissions were from the Towns of Avon, Braintree, Canton, Holbrook, Randolph, Rehoboth, Sharon, Stoughton, Walpole, and Weymouth. Project representatives attended meetings held by the Canton, Randolph, and Walpole Historical Commissions to discuss the proposed Project and the associated cultural resources surveys. The Canton Historical Commission members stated that they would likely request that Project representatives attend another meeting to further discuss the historic properties and archaeological sites identified during surveys. The Randolph, Walpole, and Weymouth Historical Commissions indicated that the Project would have no effect on significant historical properties. The Rehoboth Historical Commission stated that it does not believe the Project would affect significant historical properties, but requested that Algonquin provide it with the results of cultural resources surveys of the Rehoboth Compressor Station site. The Sharon Historical Commission requested that Algonquin provide it with the results of aboveground resources surveys along the Q-1 System Replacement. No comments have been received to date from the historical commissions in the Towns of Avon, Braintree, Holbrook, and Stoughton.

4.10.1.5 Connecticut

Aboveground Resources

The E-3 System Replacement – Fifteen aboveground resources were inventoried within the pipeline route indirect APE. Thirteen of the properties have been recommended not eligible for listing on the NRHP and no further work is recommended. Two properties (the Shannon Mausoleum (CT No. 26) and the Miantonomo Memorial (CT Survey No. 143)) have been recommended as potentially eligible for listing on the NRHP but the Project would have no effect on the properties and no further work is recommended. The Connecticut SHPO agreed with these recommendations. We concur.

Cromwell Compressor Station – Algonquin recommended that the modifications to the existing Cromwell Compressor Station would have no effect on any historic properties. The Connecticut SHPO agreed and we concur.

Archaeological Sites

The E-3 System Replacement – A total of 22 archaeological sites were located during the survey. Of these sites, 12 isolated finds or find spots and 3 archaeological sites were recommended as not eligible for listing on the NRHP and no further work is recommended. Seven sites were recommended as potentially eligible for listing on the NRHP and additional evaluations were recommended to determine the NRHP eligibility of these sites. The Connecticut SHPO agreed with the recommendations for 14 of the not eligible sites and the 7 potentially eligible sites; however, the Connecticut SHPO requested that the remaining not eligible site be considered potentially significant.

Algonquin completed evaluations at the eight sites that were recommended as potentially eligible and preliminary results indicate that three of the sites are significant and eligible for listing on the NRHP. Algonquin would provide its report documenting the results of these evaluations and recommended mitigation measures to the FERC and the Connecticut SHPO when it is complete.

Stone Wall Surveys – Algonquin submitted a Stone Wall Survey and Restoration Plan for the E-3 System Replacement to the FERC and the Connecticut SHPO. The document provides an inventory of all stone walls that would be intersected and potentially impacted by the proposed pipelines, photographs of the stone walls, and a plan for restoration of each wall regardless of any formal NRHP designation. The Connecticut SHPO commented that field stone walls possess historic and cultural importance and warrant consideration for the NRHP. Although the Project is considered to be an effect on the walls, the Connecticut SHPO has accepted the proposed Stone Wall Restoration Plan as a condition of its finding of no adverse effect.

4.10.2 Native American Consultation

Algonquin consulted the Wampanoag Tribe of Gay Head (Aquinnah), the Mashpee Wampanoag Tribe, the Massachusetts Commission on Indian Affairs, and the Massachuset-Ponkapoag Tribe (not federally recognized) in Massachusetts and the Mashantucket Pequot Tribe, the Mohegan Tribe, the Connecticut Indian Affairs Commission, and the Eastern Pequot Tribal Nation (not federally recognized) in Connecticut to provide them an opportunity to comment on the proposed Project. The FERC sent copies of the NOI to the same tribes.

The Massachusetts Commission on Indian Affairs, the Wampanoag Tribe of Gay Head, the Massachuset-Ponkapoag Tribe, and the Mashantucket Pequot Nation requested that they continue to be consulted during Project-planning activities. No responses have been received to date from the Mashpee Wampanoag Tribe, the Connecticut Indian Affairs Commission, the Mohegan Tribe, or the Eastern Pequot Tribal Nation.

The Massachusetts Commission on Indian Affairs indicated on December 5, 2007 that it would be interested in walking areas of the Project in Massachusetts containing significant archaeological sites during site evaluation studies. The Mashantucket Pequot Tribe requested that it be consulted regarding potential impacts on locations of tribal significance within the vicinity of the Project in Connecticut. Additionally, the Mashantucket Pequot Tribe requested that it be notified of any Native cultural materials encountered in the vicinity of the Project.

On February 22, 2008, Algonquin notified all consulting tribal entities that the proposed Project facilities had changed and that the proposed C-1 System and Chaplin Compressor Station modifications in Connecticut were no longer part of the Project. On March 12, 2008, the Mashantucket Pequot Tribe indicated that it understood that the Project facilities had changed; the tribe also indicated that it concurred with the Connecticut SHPO's request that additional archaeological investigations are warranted for the Rye Hill Site (in addition to the other seven potentially eligible pre-Contact archaeological sites identified during the identification survey).

On April 4, 2008, in response to a request from the FERC, Algonquin contacted Kathleen Knowles, of the Mashantucket Pequot Tribe, inquiring as to whether the Project facilities in Connecticut would cross the Mashantucket Pequot Reservation. Ms. Knowles indicated that: "all of the archaeological sites, sites of traditional, cultural, and historic significance within S.E. CT and S.W. RI are of concern to the Mashantucket Pequot Tribe and, therefore, should be included in the consultation process."

On April 7, 2008, Algonquin and its archaeological consultant met with representatives from the Mashantucket Pequot Tribe to gather information from the tribe and to listen to concerns about the Project. Representatives from the tribe were given a tour of a site along the E-3 System Replacement. The tribe has indicated a particular interest in this and another nearby site because the sites are located in an area that is of traditional cultural and religious significance to the Mashantucket Pequot Tribe.

On May 5, 2008, Algonquin met with representatives from the Massachuset-Ponkapoag Tribe and conducted a site visit along a portion of the I-10 Extension. During the tour, tribal members indicated that areas along the I-10 Extension are considered sacred to the tribe. They indicated that the tribe is concerned about blasting and requested the areas be avoided. Jim Peters, Executive Director of the Massachusetts Commission on Indian Affairs, expressed interest in a field visit and Algonquin will continue this coordination.

The Wampanoag Tribe of Gay Head (Aquinnah) indicated that it was interested in the results of the cultural resources work that Algonquin is conducting for the proposed Project and requested that the tribe continue to be consulted during Project-planning activities. Algonquin submitted a copy of the Massachusetts archaeological identification survey technical report to the tribe and submitted copies of the Connecticut archaeological identification survey technical report to all consulting tribal entities in Connecticut. All other tribal entities in Massachusetts have since received copies of the revised Massachusetts archaeological identification survey report. Consultation with the Massachusetts Commission on Indian Affairs, the Mashantucket Pequot Tribe, the Massachuset-Ponkapoag Tribe, the Wampanoag Tribe of Gay Head (Aquinnah), and other tribal entities interested in the proposed Project is ongoing.

4.10.3 Unanticipated Discoveries Procedures

Algonquin has prepared plans to be used in the event any unanticipated historic properties or human remains are encountered during construction.[5] The plans provides for the notification of interested parties, including Indian Tribes, in the event of any discovery. The MHC and the Connecticut SHPO provided comments on the plans. Algonquin revised the plans in response to the comments. We find the revised plans to be acceptable.

4.10.4 General Impact and Mitigation

Construction and operation of the pipelines and associated facilities could affect historic properties. Direct effects could include destruction or damage to all, or a portion of an archaeological site, or alteration or removal of a historic property. Indirect effects could include the introduction of visual, atmospheric, or audible elements that affect the setting or character of a historic property.

Compliance with section 106 of the NHPA has not been completed for the proposed Project. Several outstanding site evaluation reports remain to be completed and submitted to the MHC and the Connecticut SHPO and filed with the FERC. Seven archaeological sites require additional testing to determine if they are eligible for listing on the NRHP, including four in Massachusetts and three in Connecticut. If the FERC, in consultation with the MHC and Connecticut SHPO, determines that any of the sites are eligible and they cannot be avoided, Algonquin would be required to prepare a treatment plan, in consultation with the appropriate parties, to mitigate adverse effects. The FERC would afford the ACHP an opportunity to comment in accordance with Title 36 CFR Part 800.6. Implementation of a treatment plan would occur only after certification of the Project and the FERC provides written notification to proceed.

In addition, the Massachuset-Ponkapoag Tribe has identified an area along the I-10 Extension as sacred to the tribe. The tribe has asked that the area be avoided and that blasting be limited in that area. Algonquin continues to refine the routing of the proposed Project in this location.

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[5] The Unanticipated Discoveries Procedures can be viewed on the FERC Internet website at http://www.ferc.gov as part of Algonquin's Environmental Report filed on June 9, 2008. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20080612-0112 in the "Accession Number" field. They are also available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions).

To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Algonquin should not begin implementation of any treatment plans/measures (including archaeological data recovery); construction of facilities; or use of staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**

  a. Algonquin files with the Secretary cultural resources survey and evaluation reports, any necessary treatment plans, and the MHC's and Connecticut SHPO's comments on the reports and plans; and

  b. the Director of OEP reviews all cultural resources survey reports and plans, and notifies Algonquin in writing that treatment plans/mitigation measures may be implemented or construction may proceed.

  All material filed with the Secretary containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE."

4.10.5 NSTAR Alternative

Algonquin completed an architectural properties survey in 2007 along the NSTAR Alternative route. One historic district and two individual properties within the district were identified within the pipeline route indirect APE. These properties were recommended potentially eligible for listing on the NRHP in the state survey forms (see table 4.10.5-1). Algonquin recommended that pipeline construction would have no effect on these properties or the district and no further work is recommended. Five newly identified properties were recommended as not eligible for listing on the NRHP, and no further work is recommended.

TABLE 4.10.5-1

Architectural Properties Along the NSTAR Alternative Recommended Potentially Eligible for Listing on the National Register of Historic Places

Name/Location	Description	MHC Comments
Capen-Reynolds Farm, Stoughton (STG.G)	Approximately 28-acre, early 19th century farmstead.	Potentially eligible district.
Adam Capen House, Stoughton (STG.79)	One-and-one-half-story Cape Cod house constructed in 1839.	Potentially eligible contributing property in the district.
Adam Capen English Bank Barn and Wagon Shed, Stoughton (STG.82)	Ca. 1839, three-bay-wide barn and attached wagon.	Potentially eligible contributing property in the district.

The MHC commented that the NSTAR Alternative route (which was initially included as part of the I-10 Extension survey) would have an adverse effect on the agricultural landscape of the Capen-Reynolds Farm (STG.G), and that Algonquin should consider feasible alternatives to reduce the right-of-way, avoid tree removal, preserve agricultural soils, and consider additional tree planting. In addition, the MHC recommended consultation with the Town of Stoughton regarding a potential conservation restriction, and additional consultation with the MHC to determine if completion of an NRHP nomination is warranted specific to this property.

Algonquin filed its revised architectural survey report reflecting changes in the proposed Project with the MHC and the FERC. The revised report stated that Project activities near the Capen-Reynolds Farm would have no direct or indirect effects. In a letter dated September 4, 2008, the MHC commented that maintenance of existing vegetation or planting supplemental vegetation would assist in reducing any visual effects on significant historic properties, including the Capen-Reynolds Farm, as a result of the Project.

The 2007 archaeological survey resulted in the identification of six sites within the NSTAR Alternative route. Of these, one site was recommended eligible for listing on the NRHP. The remaining five sites were recommended as not eligible for listing on the NRHP and no further work is recommended. The MHC agreed with the recommendations. Algonquin completed evaluations at the NRHP-eligible site and recommended it as not eligible for listing on the NRHP. No further work is recommended at this site. The evaluation report is under preparation and Algonquin would submit it to the MHC and the FERC when completed. In addition, Algonquin would file with the FERC any pending comments from the MHC regarding the results of this archaeological site evaluation.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

The E2W Project would include the installation of the new Rehoboth Compressor Station and modifications at the existing Burrillville, Cromwell, and Hanover Compressor Stations. The Rehoboth Compressor Station would include a single Solar Taurus 70 natural gas-driven compressor with 10,310 hp at ISO. The station would also include a 7.5 million British thermal units per hour (MMBtu/hr) natural gas-fired emergency generator and a 2.94 MMBtu/hr heating boiler. The modifications at the three existing compressor stations would involve piping changes to accommodate bidirectional flow within the Algonquin system. The modifications at the Burrillville and Cromwell Compressor Stations would also involve the addition of gas aftercoolers. No additional compression would be needed at these existing compressor stations, and Algonquin does not anticipate an increase in the hours of operation or fuel use of the existing combustion turbines and compressor engines following the piping modifications. Because the modifications at the Burrillville, Cromwell, and Hanover Compressor Stations would not affect operational air quality, these stations are not discussed in detail in this section.

The E2W Project would also include the construction of approximately 12.9 miles of new 36-inch-diameter natural gas pipeline in Norfolk County, Massachusetts; the installation of 7.5 miles of 36-inch-diameter natural gas pipeline in Norfolk County, Massachusetts to replace a segment of an existing 24-inch-diameter natural gas pipeline; and the installation of approximately 11.0 miles of 12-inch-diameter natural gas pipeline in New London County, Connecticut to replace a segment of an existing 6- and 4-inch-diameter pipeline. There would be air emissions generated by the construction equipment and activities associated with building these facilities. With the exception of GHG emissions, there would be no air emissions generated by these pipeline facilities or activities during operation.

The primary pollutants emitted by natural gas compressor stations and construction activities are NO_x, volatile organic compounds (VOC), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and carbon monoxide (CO).

4.11.1.1 Existing Air Quality

The eastern portion of Massachusetts has a climate that is characterized as humid continental, with warm summers, cool winters, and high humidity year round. Normal monthly precipitation ranges from a high of 4.4 inches during the month of November to a low of approximately 3.2 inches during the month of July. The predominant wind direction in the location of the proposed Rehoboth Compressor Station is from the west.

Ambient air quality is protected by federal, state, and local regulations. The EPA has developed National Ambient Air Quality Standards (NAAQS) for certain criteria pollutants. These criteria pollutants are: nitrogen dioxide (NO_2), SO_2, PM_{10}, $PM_{2.5}$, CO, ozone, and lead. States and municipalities are free to adopt ambient air quality standards more stringent than the federal NAAQS; however, all states in which the E2W Project would occur have adopted the federal NAAQS. The federal NAAQS are presented in table 4.11.1-1.

TABLE 4.11.1-1

National Ambient Air Quality Standards and Existing Air Quality at the Proposed Rehoboth Compressor Station

Pollutants	Averaging Period	Primary NAAQS	Secondary NAAQS	Existing Air Quality Rehoboth Compressor Station 2004	2005	2006
$PM_{2.5}$	24-hour [a]	35 μg/m^3	35 μg/m^3	28 μg/m^3	22 μg/m^3	30 μg/m^3
	Annual [b]	15 μg/m^3	15 μg/m^3	10.0 μg/m^3	10.3 μg/m^3	9.5 μg/m^3
PM_{10}	24-Hour [c]	150 μg/m^3	150 μg/m^3	45 μg/m^3	54 μg/m^3	44 μg/m^3
	Annual [d]	50 μg/m^3	50 μg/m^3	21 μg/m^3	24 μg/m^3	21 μg/m^3
O_3	1-Hour [e]	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)	0.113 ppm	0.112 ppm	0.093 ppm
	8-hour [f]	0.075 ppm (147 μg/m^3)	0.075 ppm (147 μg/m^3)	0.074 ppm	0.085 ppm	0.081 ppm
SO_2	3-Hour [g]	--	0.50 ppm (1,300 μg/m^3)	0.037 ppm	0.048 ppm	0.030 ppm
	24-Hour [g]	0.14 ppm (365 μg/m^3)	--	0.024 ppm	0.023 ppm	0.020 ppm
	Annual [h]	0.03 ppm (80 μg/m^3)	--	0.007 ppm	0.006 ppm	0.005 ppm
NO_2	Annual [h]	0.05 ppm (100 μg/m^3)	0.05 ppm (100 μg/m^3)	0.008 ppm	0.008 ppm	0.007 ppm
CO	1-Hour [f]	35 ppm (40,000 μg/m^3)	--	2.4 ppm	2.8 ppm	2.5 ppm
	8-Hour [g]	9 ppm (10,000 μg/m^3)	--	1.7 ppm	1.6 ppm	1.6 ppm
Pb	Quarterly [i]	1.5 μg/m^3	1.5 μg/m^3	0.02 μg/m^3	0.02 μg/m^3	0.01 μg/m^3

[a] Not to be exceeded by the 3-year average of the 98th percentile of concentrations.
[b] Not to be exceeded by the arithmetic average of the annual arithmetic averages for 3 successive years.
[c] Not to be exceeded more than an average of once per year over 3 years.
[d] The Annual PM_{10} standard was revoked on December 18, 2006.
[e] The 1-hour ozone standard was revoked on June 15, 2005.
[f] Not to be exceeded by the 3-year average of the fourth-highest daily maximum over each year.
[g] Not to be exceeded more than once per year.
[h] Arithmetic mean.
[i] Not to be exceeded.

NAAQS = National Ambient Air Quality Standards.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
O_3 = Ozone.
SO_2 = Sulfur dioxide.
NO_2 = Nitrogen dioxide.
CO = Carbon monoxide.
Pb = lead.
μg/m^3 = Micrograms per cubic meter.
-- = Not promulgated.

Areas are designated Attainment, Unclassifiable, Nonattainment, or Maintenance on a pollutant-by-pollutant basis. Areas where the ambient air pollutant concentration is determined to be below the applicable ambient air quality standard are designated Attainment. Areas where no data are available are designated Unclassifiable. Areas where the ambient air concentration is greater than the applicable ambient air quality standard are designated Nonattainment. Areas that have been designated Nonattainment but have since demonstrated compliance with the ambient air quality standard(s) are designated Maintenance for that pollutant. Maintenance areas are treated similarly to Attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that the air quality would remain in compliance with the ambient air quality standard(s) for that pollutant.

The status of areas in Massachusetts, Connecticut, Rhode Island, and New Jersey that would be affected by the E2W Project can be found in Title 40 CFR Part 81.322, 307, 340, 333, and 331,

respectively. Table 4.11.1-2 presents the attainment status for each of the counties that would be affected by the proposed Project.

TABLE 4.11.1-2

Attainment Status for Counties Affected by the HubLine/East to West Project

County, State	Attainment/Unclassifiable	Nonattainment [a]
Norfolk County, MA	SO_2, NO_x, PM_{10}, $PM_{2.5}$, and CO	O_3 (1-hour serious, 8-hour moderate)
Bristol County, MA	SO_2, NO_x, PM_{10}, $PM_{2.5}$, and CO	O_3 (1-hour serious, 8-hour moderate)
New London County, CT	SO_2, NO_x, PM_{10}, $PM_{2.5}$, and CO	O_3 (1-hour serious, 8-hour moderate)
Middlesex County, CT	SO_2, NO_x, PM_{10}, $PM_{2.5}$, and CO [b]	O_3 (1-hour serious, 8-hour moderate)
Providence County, RI	SO_2, NO_x, PM_{10}, $PM_{2.5}$, and CO	O_3 (1-hour serious, 8-hour moderate)
Morris County, NJ	SO_2, NO_x, PM_{10}, and CO	O_3 (1-hour severe-17, 8-hour moderate), $PM_{2.5}$

[a] Although the 1-hour ozone standard has been replaced by the 8-hour ozone standard, the 1-hour ozone designations will remain in effect until the states have modified their regulations to implement the 8-hour standard.

[b] Carbon monoxide Attainment area with a maintenance plan.

SO_2 = Sulfur dioxide.
NO_x = Nitrogen oxides.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
CO = Carbon monoxide.
O_3 = Ozone.

The existing ambient air concentrations at the vicinity of the proposed Rehoboth Compressor Station were evaluated by reviewing representative air monitoring data from various monitoring locations. The closest and most representative data were obtained from the EPA's AirData database for the years 2004 through 2006 from three monitoring stations in close proximity to the proposed Rehoboth Compressor Station (EPA, 2008). CO, NO_2, $PM_{2.5}$, SO_2, and ozone data were taken from two separate monitoring stations located in Providence, Rhode Island. PM_{10} data were taken from a monitoring station in Pawtucket, Rhode Island, and lead data were taken from a monitoring station in Boston, Massachusetts.

The highest concentrations measured during the 2004 through 2006 period for each of the pollutants and averaging periods at the air quality monitoring stations closest to the proposed Rehoboth Compressor Stations are summarized in table 4.11.1-1. Air quality data for the area near the Rehoboth Compressor Station show moderate nonattainment of the 8-hour ozone standard.

4.11.1.2 Air Quality Regulatory Requirements

Air quality in the United States is regulated by federal statutes in the CAA and its amendments. The provisions of the CAA that are applicable to the E2W Project include:

- Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR);
- Federal Class I Area Protection;
- Conformity of General Federal Actions;
- National Emission Standards for Hazardous Air Pollutants (NESHAPs);
- New Source Performance Standards (NSPS);

- Title V air permitting; and

- State air permitting.

Prevention of Significant Deterioration and Nonattainment New Source Review – Ambient air quality is protected by the EPA's PSD and Nonattainment NSR programs. The PSD regulations apply to new major stationary sources or major modifications to stationary sources located in Attainment areas. The Nonattainment NSR regulations apply to new or modified stationary sources located in Nonattainment areas. The PSD regulations, as codified in Title 40 CFR Part 52.21, define a major source or major modification as:

- a source with a potential-to-emit (PTE) of more than 100 tons per year (tpy) of any criteria pollutant for a facility that is one of the 28 industrial source categories listed in Title 40 CFR Part 52.21(b)(1)(i)(a);

- a source with a PTE of more than 250 tpy of any criteria pollutant for a facility that is not one of the 28 industrial source categories listed in Title 40 CFR Part 52.21(b)(1)(i)(a);

- a modification to an existing major source that results in a net emissions increase greater than the PSD significant emission rate specified in Title 40 CFR Part 52.21 (b)(23)(i); or

- an existing minor source proposing a modification that is major by itself.

As stated above, the proposed Rehoboth Compressor Station would be located in Bristol County, Massachusetts. Bristol County, Massachusetts is designated moderate Nonattainment for the 8-hour ozone standard and Unclassifiable or Attainment for the NAAQS for all other criteria pollutants. NO_x and VOC are precursor pollutants to ozone; therefore, Nonattainment NSR thresholds for areas designated nonattainment for ozone have been set for NO_x and VOC. The Nonattainment NSR thresholds for NO_x and VOC are both set at 50 tpy. As shown in table 4.11.1-3, the annual emissions for the Rehoboth Compressor Station would fall below these thresholds; therefore, Nonattainment NSR does not apply.

The potential emissions of each regulated pollutant (NO_x, CO, VOC, SO_2, $PM_{2.5}$, and PM_{10}) from the addition of the Rehoboth Compressor Station are summarized in table 4.11.1-3 in comparison with the applicable major source threshold.

As shown in table 4.11.1-3, the net emissions associated with the addition of the Rehoboth Compressor Station for each of the criteria pollutants would be less than the major source applicability thresholds; therefore, they would not be subject to PSD review.

Federal Class I Area Protection – Certain lands were designated as Mandatory Federal Class I (Class I) Areas as a part of the CAA Amendments of 1977. Class I Areas were designated because the air quality was considered a special feature of the area (e.g., national parks, wilderness areas, national forests). Federal Class I Areas are protected against several types of pollution including criteria pollutant concentrations, visibility degradation, and acidic deposition. If the new source or major modification is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I Area, the facility is required to notify the appropriate federal officials and assess the impacts of that project on the nearby Class I Area. There are no Class I Areas within 100 kilometers of the E2W Project. The nearest Class I Areas to the E2W Project are the Lye Brook in New Hampshire and Brigantine Wilderness in New Jersey. These areas are at least 93 miles (150 kilometers) from any portion of the E2W Project. Additionally, because the Rehoboth Compressor Station would not trigger PSD review, an air quality impact determination would not be required.

TABLE 4.11.1-3

Estimated Net Emissions for the HubLine/East to West Project

Facility/Pollutant	Facility-Wide Emissions Subject to Nonattainment NSR/NESHAP Review (tpy)	Nonattainment NSR/NESHAP Threshold (tpy)	Facility-Wide Emissions Subject to PSD Review (tpy)	PSD Applicability Threshold (tpy)
Rehoboth Compressor Station				
NO_x	22.73	50	22.73	250
CO	N/A	N/A	36.84	250
VOC	45.30	50	N/A	N/A
SO_2	N/A	N/A	1.29	250
$PM_{2.5}$	N/A	N/A	2.65	250
PM_{10}	N/A	N/A	2.65	250
HAP (Individual)	1.62	10	N/A	N/A
HAP (Total)	5.92	25	N/A	N/A

NO_x = Nitrogen oxides.
CO = Carbon monoxide.
VOC = Volatile organic compounds.
SO_2 = Sulfur dioxide.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
HAP = Hazardous Air Pollutant.
NSR = New source review.
NESHAP = National Emission Standards for Hazardous Air Pollutants.
tpy = Tons per year.
N/A = Not Applicable.

Conformity of General Federal Actions – A conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the conformity threshold levels (*de minimis*) of the pollutant(s) for which an air basin is in Nonattainment or Attainment with a maintenance plan. According to section 176(c)(1) of the CAA (Title 40 CFR Part 51.853), a federal agency cannot approve or support any activity that does not conform to an approved State Implementation Plan (SIP). Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

General conformity assessments must be completed when the total direct and indirect emissions of a planned project would equal or exceed specified pollutant thresholds per year in each Nonattainment area or Attainment area with a maintenance plan. With regard to the proposed Project, the relevant general conformity pollutant thresholds are:

- $PM_{2.5}$: 100 tpy in a Nonattainment area;
- $PM_{2.5}$ precursors: 100 tpy of SO_2, NO_x, and potentially VOC, and NH_3 if determined to be significant precursors;
- ozone precursors: 50 tpy of VOC and 100 tpy of NO_x in moderate ozone Nonattainment areas located within an ozone transport region;

- CO: 100 tpy of CO in Attainment areas with a maintenance plan; and

- if emissions of a Nonattainment pollutant are regionally significant (i.e., emissions of a Nonattainment pollutant equal or exceed 10 percent of the Nonattainment area emissions of the Nonattainment pollutant).

A conformity analysis must show that the emissions would conform to the currently applicable SIP and would not reduce air quality in the basin, which can be demonstrated through offsets, SIP provisions, or modeling.

Operational emissions for the E2W Project, as presented in table 4.11.1-3, would be generated by the Rehoboth Compressor Station, which would be located in Bristol County, Massachusetts. Bristol County is listed as serious Nonattainment for the 1-hour ozone standard and moderate Nonattainment for the 8-hour ozone standard. Algonquin also provided construction emissions for the E2W Project, which are presented in section 4.11.1.3. Portions of the construction activities would occur in areas listed as serious Nonattainment for the 1-hour ozone standard, moderate Nonattainment for the 8-hour ozone standard, Nonattainment for the $PM_{2.5}$ standard, and Attainment with a maintenance plan for CO.

The construction emissions estimates were provided as total emissions for each portion of the Project, which does not allow for a direct comparison of total annual emissions in each Nonattainment area or Attainment area with a maintenance plan with the general conformity *de minimis* levels. Therefore, we combined the total construction emissions with the maximum annual operational emissions for each Nonattainment area or Attainment area with a maintenance plan to determine whether any portion of the Project has the potential to exceed general conformity *de minimis* levels. The results of our assessment are presented in table 4.11.1-4.

As shown in table 4.11.1.4, the total annual emissions potentials for those portions of the E2W Project that would be constructed in a Nonattainment area or Attainment area with a maintenance plan would not exceed general conformity *de minimis* levels. Based upon this evaluation, a general conformity assessment is not required.

National Emission Standards for Hazardous Air Pollutants (NESHAP) – Title 40 CFR Parts 61 and 63 regulate facilities that emit specific Hazardous Air Pollutants (HAPs). Part 61 was promulgated before the 1990 CAA amendments and regulates only eight hazardous substances. The CAA as amended in 1990 established a list of 189 HAPs and guidelines for regulating these pollutants from any major source, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources and specific source categories. Part 63 defines a major source of HAPs as any source that has the PTE 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

The E2W Project would not include any of the specific sources for which NESHAP have been established in Part 61; therefore, the Part 61 NESHAP requirements would not apply to the Project. The Project does include emission units in categories for which Part 63 NESHAP have been established; however, these standards only apply to facilities that exceed the HAP major source thresholds stated above. As shown in table 4.11.1-3, the Project would be a minor source with respect to NESHAP Part 63; therefore, these standards would not apply to the Project. Additionally, the Project would not include any emission units in source categories for which area source NESHAP requirements apply, so the Project would not be subject to Part 63 NESHAP requirements.

TABLE 4.11.1-4

General Conformity Analysis for the HubLine/East to West Project (tons)

Nonattainment Area	NO_x	CO	$PM_{2.5}$	VOC
Bristol County, MA (Ozone Nonattainment)				
Rehoboth Compressor Station Construction Emissions	4.88	N/A	N/A	0.94
Rehoboth Compressor Station Annual Operational Emissions	22.73	N/A	N/A	45.30
Total Bristol County, MA Emissions Potential	**27.61**	**N/A**	**N/A**	**46.24**
Norfolk County, MA (Ozone Nonattainment)				
I-10 Extension Construction Emissions	48.61	N/A	N/A	19.76
Q-1 System Replacement Construction Emissions	21.40	N/A	N/A	22.65
Total Norfolk County, MA Emissions Potential	**70.01**	**N/A**	**N/A**	**42.41**
New London County, CT (Ozone Nonattainment)				
E-3 System Replacement Construction Emissions	24.01	N/A	N/A	5.31
Total New London County, CT Emissions Potential	**24.01**	**N/A**	**N/A**	**5.31**
Middlesex County, CT (Ozone Nonattainment, CO Maintenance [a])				
Cromwell Compressor Station Construction Emissions [b]	2.94	53.10	N/A	1.39
Total Middlesex County, CT Emissions Potential	**2.94**	**53.10**	**N/A**	**1.39**
Providence County, RI (Ozone Nonattainment)				
Burrillville Compressor Station Construction Emissions [b]	2.94	N/A	N/A	1.39
Total Providence County, RI Emissions Potential	**2.94**	**N/A**	**N/A**	**1.39**
Morris County, NJ (Ozone Nonattainment, $PM_{2.5}$ Nonattainment)				
Hanover Compressor Station Construction Emissions [b]	2.94	N/A	0.12	1.39
Total Morris County, NJ Emissions Potential	**2.94**	**N/A**	**0.12**	**1.39**
General Conformity *De Minimis* Thresholds	**100**	**100**	**100**	**50**

[a] The Cromwell Compressor Station construction activities would be located within the former Hartford-New Britain-Middleton, CT CO Nonattainment Area, which is currently classified as Attainment with a maintenance plan.

[b] The Cromwell, Burrillville, and Hanover Compressor Stations construction emissions were provided as an aggregate emissions estimate. The emissions presented for construction of each station represent the aggregate emission total divided by the number of stations.

NO_x = Nitrogen oxides.
CO = Carbon monoxide.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
VOC = Volatile organic compounds.
N/A = Not applicable.

New Source Performance Standards – The NSPS, codified in Title 40 CFR Part 60, apply to new, modified, or reconstructed stationary sources that meet or exceed specified applicability thresholds. The NSPS are divided into several subparts. Each subpart regulates a specific source type and size. The potentially applicable subparts are addressed below.

Subpart KKKK applies to new, modified, or reconstructed stationary gas turbines with a heat input at peak load of greater than or equal to 10 MMBtu/hr constructed after February 19, 2005. Subpart KKKK establishes NO_x emission limits. The proposed turbine to be installed at the Rehoboth Compressor Station would be subject to Subpart KKKK emission limitations, monitoring requirements, and test methods for stationary gas turbines.

Subpart Dc applies to steam generating units with a maximum design heat input capacity of greater than or equal to 10 MMBtu/hr, but less than or equal to 100 MMBtu/hr that are constructed, modified, or reconstructed after June 9, 1989. Because the heat input rate for the boilers proposed to be installed at the Rehoboth Compressor Station would be less than this threshold, there is no NSPS applicable to the boilers and, therefore, Subpart Dc would not apply.

Subpart JJJJ was proposed by the EPA in the Federal Register on June 12, 2006. The proposed NSPS would regulate emissions of NO_x, CO, and non-methane hydrocarbons from the natural gas-fired emergency reciprocating engine proposed as part of the E2W Project. The emergency engine would be subject to the emission standards applicable to stationary non-emergency spark ignition engines greater than or equal to 500 hp. Subpart JJJJ establishes NO_x and CO emission limits based upon the manufacture date of the engine; therefore, the emission limits applicable to the natural gas-fired emergency reciprocating engine may vary based upon the date of manufacture of the engine purchased for the E2W Project. Subpart JJJJ would also limit the sulfur content of gas used in engines subject to this NSPS.

Subpart Kb potentially applies to volatile organic liquid storage vessels with a capacity greater than 75 cubic meters that were constructed, modified, or reconstructed after July 23, 1984. A capacity of 75 cubic meters is equal to approximately 19,813 gallons. No volatile organic liquid storage vessels proposed for the E2W Project would have a capacity exceeding this threshold; therefore, the storage tanks at the proposed Rehoboth Compressor Station would not be subject to Subpart Kb.

Title V Permitting – Title V of the CAA requires each state to develop an operating permit program. The operating permit program is implemented through Title 40 CFR Part 70 and establishes applicability thresholds for criteria pollutants and HAPs. If a facility's PTE exceeds one or more of these thresholds, the facility is considered a "major source." The major source threshold for a source in an Attainment area is 100 tpy of PM_{10}, SO_2, NO_x, VOC, or CO. As presented in table 4.11.1-3, the annual emissions for the proposed Rehoboth Compressor Station would be below Title V major source thresholds; therefore, the E2W Project would not be subject to Title V permit requirements.

State Air Permitting – The proposed Rehoboth Compressor Station would be considered a Non-Major emissions source with respect to MassDEP air emission permitting. The air permitting of the proposed compressor station would be limited to a MassDEP Plan Approval, and the Application for Permit to Construct would be a Non-Major Comprehensive Plan Approval. Massachusetts air quality permitting requirements are identified in 310 CMR 7. A MassDEP Plan Approval is required for the proposed Project because the Rehoboth Compressor Station emissions would not meet Industry Performance Standards emission limits contained in 310 CMR 7.26(43). Algonquin has stated that the rapid cycling and limited run times in the largely unmanned environment of a mechanical compressor-driven engine prohibit the application of add-on control equipment that would be required to meet the Massachusetts Environmental Results Program emission standards.

Massachusetts requires a state-level Best Available Control Technology (BACT) analysis for certain criteria pollutants (i.e., NO_x, SO_2, VOCs, PM_{10}, lead, and CO) be performed using a "Top Down Approach" that evaluates the best available control based upon energy, environmental, and economic impacts. Algonquin has submitted the BACT analysis to the MassDEP for review and approval. Because Algonquin is not proposing to use ammonia injection for NO_x control, a BACT analysis was not completed for ammonia. Additionally, because no appreciable lead is emitted from natural gas combustion, a BACT analysis was not completed for lead.

310 CMR 7.06(1) established a visual opacity standard for non-water vapor emissions from fuel burning equipment to less than 20 percent for more than 2 minutes in any continuous 1-hour period.

Compliance with this standard would be easily met by the proposed natural gas-fired combustion turbine. 310 CMR 7.02(8) limits the particulate emissions from fuel burning sources to 0.10 pounds/MMBtu for sources less than 250 MMBtu/hr heat input. The proposed particulate emission rates for the combustion turbines at the Rehoboth Compressor Station would be below this standard. 310 CMR 7.05(1)(d)1 limits the sulfur content of liquid fuel to 0.5 percent. This standard is not applicable to the Project because the combustion turbines would only burn natural gas. 310 CMR 7.28 describes the Massachusetts NO_x Allowance Trading Program. This program applies to generators greater than 15 MW, or individual boilers greater than 250 MMBtu/hr. The equipment proposed for the Rehoboth Compressor Station would not be subject to this program.

The MassDEP requested that air dispersion modeling be completed for the proposed Rehoboth Compressor Station to demonstrate compliance with applicable air quality standards. In response to this request, Algonquin completed a screening analysis to compare the Project impacts with Significant Impact Levels. Where the screening analysis showed that Project impacts exceeded a Significant Impact Level, a more detailed NAAQS compliance demonstration was performed. NO_2 and PM_{10} (24-hour and annual) exceeded one Significant Impact Level; however, once background concentrations are included, the Project emissions would not result in an exceedance of the NAAQS. For the purpose of assessing potential cumulative impacts on air quality (see section 4.11.1.3) as a result of the Rehoboth Compressor Station, a similar NAAQS analysis was completed for the other pollutants that did not exceed one Significant Impact Level. The results of the modeling analysis are presented in table 4.11.1-5.

TABLE 4.11.1-5

Air Dispersion Modeling Analysis for the Rehoboth Compressor Station – HubLine/East to West Project

Pollutant	Averaging Period	Pollutant Concentration ($\mu g/m^3$)[a]	Significant Impact Level ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2 [b]	Annual	8.88	1	15	23.93	100
CO	1-Hour	1188	2000	3220	4408	40,000
	8-Hour	440.32	500	1840	2280.32	10,000
SO_2	3-Hour	3.72	24	125.8	129.52	1,300
	24-Hour	1.17	5	60.3	61.47	365
	Annual	0.22	1	15.7	15.92	80
PM_{10}	24-Hour	6.14	5	54	60.14	150
	Annual	6.14	1	24	30.14	50

[a] Pollutant concentration results were obtained using the U.S. Environmental Protection Agency's SCREEN3 model.
[b] Assumes 75 percent conversion from NO_x to NO_2.
NO_x = Nitrogen oxides.
NO_2 = Nitrogen dioxide.
CO = Carbon monoxide.
SO_2 = Sulfur dioxide.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
$\mu g/m^3$ = Micrograms per cubic meter.
NAAQS = National Ambient Air Quality Standard.
N/A = Not Applicable.

4.11.1.3 Air Emission Impacts and Mitigation

Construction Emissions

Construction activities for the proposed facilities would result in temporary increases in emissions of some pollutants at the proposed Rehoboth Compressor Station and along the pipeline routes due to the use of equipment powered by diesel fuel or gasoline engines. Construction activities would also result in

the temporary generation of fugitive dust due to land clearing, ground excavation, and cut and fill operations. Indirect emissions during the construction portion of the Project would be generated by delivery vehicles and construction worker commuting.

Algonquin estimated emissions from construction activities based upon the anticipated types of non-road and on-road equipment and their projected level of use, including estimates for emissions associated with construction work travel to and from the construction site and emissions from anticipated pipeline blowdown events resulting from the construction activities. Blowdowns involve the evacuation of gas, which enables piping to be taken out of or placed in service. Small amounts of natural gas would be released during these blowdown events. Algonquin does not plan to use open burning for vegetation clearing; therefore, no emissions from open burning activities have been included in the estimates. Table 4.11.1-6 presents the estimated construction emissions.

TABLE 4.11.1-6

Estimated Construction Emissions for the HubLine/East to West Project (tons)

Construction Activity	NO_x	CO	$PM_{10}/PM_{2.5}$	SO_2	VOC	HAPS
Rehoboth Compressor Station	4.88	13.34	0.20	0.20	0.94	0.01
I-10 Extension	48.61	179.23	1.50	1.97	19.76	1.34
Q-1 System Replacement	21.40	125.80	0.73	0.93	22.65	2.09
E-3 System Replacement	24.01	117.66	0.79	1.01	5.31	0.35
Modifications at Existing Compressor Stations	8.82	159.28	0.36	0.54	4.18	0.05

NO_x = Nitrogen oxides.
CO = Carbon monoxide.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
SO_2 = Sulfur dioxide.
VOC = Volatile organic compounds.
HAPS = Hazardous Air Pollutants.

Additionally, Algonquin estimated fugitive particulate emissions from the compressor station and pipeline construction activities. Table 4.11.1-7 presents the estimated fugitive particulate emissions from construction activities.

TABLE 4.11.1-7

Estimated Fugitive Particulate Emissions from Construction of the HubLine/East to West Project (tons)

Construction Activity	TSP	PM_{10}	$PM_{2.5}$
Rehoboth Compressor Station	173.86	13.34	0.20
I-10 Extension	48.61	179.23	1.97
Q-1 System Replacement	21.40	125.80	0.93
E-3 System Replacement	24.01	117.66	1.01
Paved Roadway Fugitive Emissions	8.82	159.28	0.54

TSP = Total suspended particulate.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.

Although Algonquin has stated that fugitive particulate emissions generated during construction would be mitigated, if necessary, by spraying water to dampen the surfaces of dry work areas, Algonquin has not provided a specific Dust Control Plan. Because the construction work area for the E2W Project would be within 50 feet of 176 residential or other structures (see section 4.8.3.1) and would cross 67

public roads (see section 4.9.4), we believe that a Dust Control Plan that specifies mitigation measures for dust abatement in addition to spraying of water (e.g., reducing vehicle speeds where appropriate for travel on unsurfaced roads, using palliative in high erosion areas to control dust in residential areas and near road crossings, and training of Project personnel) is necessary. Therefore, **we recommend that:**

- **Algonquin should prepare a Dust Control Plan that specifies the following:**

  a. the mitigation measures to be used for dust abatement;

  b. the performance requirements, if applicable (e.g., visible opacity standards);

  c. the individuals with authority to determine when additional dust control measures are necessary; and

  d. the individuals with authority to stop work if the contractor does not comply with dust control measures.

  The Dust Control Plan should be filed with the Secretary <u>during the draft EIS comment period</u>.

The construction phase of the proposed Project would result in the generation of diesel combustion emissions associated with the operation of construction equipment and vehicles. Massachusetts, Connecticut, Rhode Island, and New Jersey have developed standards to limit emissions from diesel engines through idling restrictions (i.e., 310 CMR 7.111b; Regulation of Connecticut State Agencies Title 22a section 22a-174-19; Rhode Island Department of Environmental Management, Office of Air Resources, Air Pollution Control Regulation No. 45; and New Jersey Administrative Code Title 7, Chapter 27, Subchapter 14). In addition, some of the states in which the Project would occur have developed guidance (e.g., the MassDEP's January 2008 guidance on diesel engine retrofitting) for other methods of reducing diesel emissions, such as the use of low sulfur diesel, cleaner diesel alternatives fuels, and advanced pollution control technologies. Algonquin provided an estimate of construction-related emissions (see table 4.11.1-6) that includes diesel combustion emissions for the E2W Project. Algonquin did not, however, specify measures that it would implement to minimize diesel emissions and comply with the appropriate state standards. Therefore, **we recommend that:**

- **Algonquin should file the specific measures it would implement during construction to minimize diesel combustion emissions and comply with the applicable state diesel emissions standards with the Secretary <u>during the draft EIS comment period</u>.**

Operation Emissions

The proposed turbines and fuel gas heater would operate on natural gas. Therefore, the primary pollutants emitted by these units would be NO_x and CO. As discussed in section 4.11.1.2, the proposed Rehoboth Compressor Station would not be subject to PSD review. However, during the state permitting process, the proposed equipment would be required to meet currently prescribed BACT requirements, quantitatively assess the ambient air impacts associated with the proposed Project through air dispersion modeling, and demonstrate that the Project would not cause or significantly contribute to a violation of an applicable air quality standard.

As discussed in section 4.11.1.2, an air dispersion modeling analysis was completed demonstrating compliance with the NAAQS. There are no major air pollutant sources in the immediate area of the proposed Rehoboth Compressor Station. There are three power plants: Taunton Municipal Light (approximately 10 miles away); Dighton Power (approximately 10 miles away); and Manchester Street Station in Providence (approximately 8 miles away). To assess whether the Project has the potential to contribute to a violation of the NAAQS, the modeled emissions at the station fenceline were added to background concentrations for the three most recent years taken from the EPA AirData Website (EPA, 2008). The results of this assessment are presented in table 4.11.1-5. The modeled emissions along with the background concentrations were below the NAAQS for all criteria pollutants over all averaging periods. Based upon this assessment, the Project would not contribute to a cumulative air impact.

4.11.1.4 Greenhouse Gas Emissions

Although CO_2 is not a regulated pollutant, with respect to the CAA, it is associated with GHG emissions, along with other gases such as methane and chlorofluorocarbons. GHG emissions are vital to life on earth because they help to maintain ambient temperatures. However, excess GHG emissions augment this effect and are considered by many experts to contribute to overall global climatic changes, typically referred to as global warming. CO_2 emissions are a product of natural and anthropogenic activities, including fossil fuel combustion. Large quantities of GHG emissions would decrease the amount of infrared or heat energy radiated by the earth back to space and upset the heat balance. Global warming may ultimately contribute to a rise in sea level, destruction of estuaries and coastal wetlands, and changes in regional temperature and rainfall pattern, with significant agricultural and coastal community implications.

The estimated GHG emissions for construction of the proposed Project are provided in table 4.11.1-8. The estimated GHG emissions for operation of the proposed Rehoboth Compressor Station are provided in table 4.11.1-9.

TABLE 4.11.1-8

Estimated Greenhouse Gas Emissions from Construction of the HubLine/East to West Project (tons)

Construction	CO_2	CH_4	N_2O	CO_2e [a]
Rehoboth Compressor Station	2,015.9	0.11	0.05	2,034.5
I-10 Extension	9,003.3	162.54	0.38	13,180.4
Q-1 System Replacement	4,775.9	249.48	0.16	10,820.3
E-3 System Replacement	4,834.2	9.75	0.10	5,109.1
Piping Modifications at Existing Compressor Stations	3,168.04	0.06	0.03	3,183.96
Total	23,797.34	421.94	0.72	34,328.26

[a] CO_2e was calculated using the Intergovernmental Panel on Climate Change Fourth Assessment Report Global Warming Potentials.

CO_2 = Carbon dioxide.
CH_4 = Methane.
N_2O = Nitrous oxide.
CO_2e = Carbon dioxide equivalents.

TABLE 4.11.1-9

Estimated Greenhouse Gas Emissions from Operation of the Rehoboth Compressor Station (tons per year)

Emission Source	Maximum Annual CO_2	Maximum Annual CH_4	Maximum Annual N_2O	Maximum Total CO_2e [a]	Projected Annual CO_2e [a, b]
Solar Taurus 70 Compressor	43,874.6	11.0	0.74	44,371	15,196
Heating Boiler	1,829.1	0.04	0.031	1,839	1,839
Emergency Generator	131.1	2.3	0.00025	189	189
Other Station Combustion	800.2	0.9	0.0015	822	822
Natural Gas Releases	11.4	286.6	N/A	7,177	7,177
Fugitive Emissions	1.2	30.8	N/A	239	239
Total	46,647.6	331.6	0.77	54,637	25,462

[a] CO_2e calculated using the Intergovernmental Panel on Climate Change Fourth Assessment Report Global Warming Potentials.

[b] Projected annual CO_2e based upon typical annual operation of 3,000 hours per year.

CO_2 = Carbon dioxide.
CH_4 = Methane.
N_2O = Nitrous oxide.
CO_2e = Carbon dioxide equivalents.
N/A = Not available.

As shown in tables 4.11.1-8 and 4.11.1-9, construction of the E2W Project would result in the generation of approximately 34,329 tons of GHG emissions, as measured in CO_2 equivalents, and operation of the Rehoboth Compressor Station would result in a maximum of 54,637 tpy of GHG emissions, as measured in CO_2 equivalents, if operated at full capacity (i.e., 8,760 hours per year). Because the compressor station is projected to operate between 2,000 and 4,000 hours per year, Algonquin provided a projected annual GHG emissions estimate for the operation of the Rehoboth Compressor Station based upon 3,000 hours per year, resulting in projected annual GHG emissions for the operation of the Rehoboth Compressor Station of approximately 25,462 tpy, as measured in CO_2 equivalents.

The MEEA has adopted a policy that requires that certain projects undergoing environmental review quantify the project's GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. One potential alternative for mitigating direct GHG emissions resulting from the operation of the Rehoboth Compressor station would be to install an electrical-driven compressor instead of a natural gas-driven compressor. However, the electricity used to drive an electrical-driven compressor would also result in GHG emissions, which may be higher than the combustion of natural gas due to multiple energy efficiency losses. Additionally, the Rehoboth Compressor Station area does not have an existing transmission network in close proximity to supply the large load needed to power an electrical-driven compressor at the station. The addition of new high voltage supply lines would require the creation of new right-of-way resulting in additional environmental impacts.

The natural gas released to the atmosphere during periodic blowdown events also results in direct GHG emissions. Blowdown events during operation are typically associated with major repairs, maintenance, or emergency events. The release of natural gas results in the loss of saleable product; therefore, Algonquin utilizes best management practices during pipeline operation to minimize, to the extent practicable, the release of natural gas to the atmosphere. The GHG emissions resulting from blowdown events have been included in table 4.11.1-7; these emission estimates account for the use of best management practices to minimize natural gas release to the atmosphere.

Generally, natural gas compressor stations are unmanned and remotely operated; however, the proposed Rehoboth Compressor Station would have 13 employees working onsite. Due to the small number of employees at the facility, the addition of the proposed Rehoboth Compressor Station would not result in a significant amount of indirect GHG emissions from employee and/or vendor vehicle trips. The proposed Rehoboth Compressor Station would occupy a small footprint (i.e., 10.3 acres) within a 97–acre site. Most of this 97-acre site is covered by forest land. The area not encompassed by the station footprint would be preserved as screening and buffering for the compressor station or potentially used as conservation or mitigation areas. This land use is consistent with the Siting and Site Design mitigation strategies contained in the MEEA's Greenhouse Gas Emissions Policy and Protocol.

The GHG emissions from the construction and operation of the E2W Project would be negligible compared to the global GHG emission budget. Additionally, natural gas is a lower CO_2 emitting fuel as compared to other fuel sources (e.g., fuel oil). Because fuel oil is widely used as an alternative to natural gas in the region in which the E2W Project would be located, it is anticipated that the Project would result in the displacement of some fuel oil use, thereby regionally offsetting some GHG emissions.

4.11.1.5 Remote Blow-off Valve Sites

In addition to the blowdown events that would occur associated with compressor station operation, Algonquin proposes to install new remote blow-off[6] valve sites along the pipeline routes. One remote blow-off valve site would be located adjacent to a mainline valve site near MP 1.3 on the I-10 Extension, and another remote blow-off valve site would be located adjacent to a tap at MP 15.6 of the Q-1 System Replacement, although the latter site is not identified on the E2W Project alignment sheets. These two sites would generate GHG emissions during the operation of the E2W Project; however, specific information regarding the potential GHG emissions from these facilities has not been provided by Algonquin. To ensure that the facilities would comply with the MEEA's Greenhouse Gas Emissions Policy and Protocol, **we recommend that:**

- **Algonquin should provide information related to the proposed remote blow-off valve sites that includes:**

  a. the specific location of all proposed remote blow-off valve sites;

  b. an estimate of the potential GHG emissions from these facilities; and

  c. if needed, a description of proposed mitigation measures to ensure that these emissions would comply with the MEEA's Greenhouse Gas Emissions Policy and Protocol.

  Algonquin should file this information with the Secretary <u>during the draft EIS comment period</u>.

As discussed in section 3.6.2, we have some concerns about the proposed location and orientation of the blow-off valve site at MP 1.3 of the I-10 Extension and its close proximity to the residences abutting Harding Avenue and have recommended that Algonquin provide an alternatives site analysis for this proposed valve site. The noise impacts of blowdown events are discussed in section 4.11.2.3.

[6] Algonquin uses the term blow-off instead of blowdown when referring to its valve sites.

4.11.2 Noise

At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. Variation is caused in part by changing weather conditions, the effects of seasonal vegetative cover, and human activities. Two measures used by federal agencies for the time-varying quality of environmental noise known to affect people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night equivalent sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of concern, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels of the A-weighted scale (dBA) added to nighttime sound levels between the hours of 10:00 PM and 7:00 AM to account for people's greater sensitivity to sound during nighttime hours. The human ear's threshold of perception for noise change is 3 dBA.

4.11.2.1 Existing Noise Levels

Ambient noise surveys and acoustical analyses were conducted for the proposed new Rehoboth Compressor Station. Ambient noise survey and acoustical analyses were also conducted for the existing Burrillville and Cromwell Compressor Stations because they would involve the addition of gas aftercoolers as well as piping modifications to accommodate bidirectional flow. Acoustical analyses were not completed for the existing Hanover Compressor Station because the proposed modifications at this station consist only of piping changes to accommodate bidirectional flow, which would not result in a change to the noise contribution from the station. However, the existing noise contribution from the Hanover Compressor Station at the nearest noise-sensitive area (NSA) is presented in section 4.11.2.3. All ambient noise surveys and acoustical analyses were completed by Hoover and Keith, Inc. (H&K).

Rehoboth Compressor Station

The proposed Rehoboth Compressor Station would be located in Bristol County, Massachusetts, approximately 5 miles southwest of the Town of Rehoboth, Massachusetts and approximately 5 miles northeast of the City of Pawtucket, Rhode Island. The proposed location of the Rehoboth Compressor Station is a 97-acre site that is vegetated with upland forest. There are several NSAs located in the vicinity of the proposed compressor station. The closest are residences that are currently under construction approximately 1,600 feet north-northwest of the center of the site. The nearest NSAs are listed in table 4.11.2-1 and shown on figure 4.11.2-1. As discussed in section 4.11.1.4, the compressor station would occupy a 10.3-acre footprint and the remainder of the site would be preserved as screening and buffering or potentially used as conservation or mitigation areas. Therefore, significant foliage would remain between the proposed compressor station and the nearby NSAs. A study of existing noise levels at the nearest NSAs was conducted by H&K on October 10, 2007. The results of the noise study are presented in table 4.11.2-1.

TABLE 4.11.2-1

Background Noise Levels at the Nearest Noise-Sensitive Areas to the Proposed Rehoboth Compressor Station and the Existing Burrillville and Cromwell Compressor Stations

Facility/Location	Distance to NSA	Direction to NSA	Ambient L_{dn}
Proposed Rehoboth Compressor Station			
NSA 1	1,600 feet	North-northwest	42.8 dBA [a]
NSA 2	1,800 feet	South-southwest	44.1 dBA [a]
NSA 3	2,300 feet	West	41.7 dBA [a]
NSA 4	2,000 feet	East	41.7 dBA [b]
Existing Burrillville Compressor Station			
NSA 1	2,050 feet	East-northeast	54.6 dBA [c]
Existing Cromwell Compressor Station			
NSA 1	850 feet	West	58.3 dBA [d]

[a] Ambient L_{dn} calculated based upon measured L_d and L_n.
[b] Ambient sound level for NSA 4 was not measured but assumed to be similar to the measured sound levels at NSA 3.
[c] Ambient L_{dn} calculated based upon results of the most recent noise survey conducted by Hoover and Keith, Inc. in 2004. The noise survey was conducted while the compressor station was operating at full load. The ambient result is the estimated noise contribution from the compressor station, which is the dominant noise source at the NSA.
[d] Ambient L_{dn} is based upon measured L_d. The station was operating at 41 percent of full capacity during the noise survey.
NSA = noise-sensitive area.
dBA = decibels on the A-weighted scale.
L_{dn} = day-night equivalent sound level.
L_d = daytime sound level.
L_n = nighttime sound level.

Burrillville Compressor Station

The existing Burrillville Compressor Station is located in Providence County, Rhode Island, approximately 25 miles northwest of the City of Providence. The Burrillville Compressor Station occupies a small portion of a heavily wooded property owned by Algonquin. The land use surrounding the area is primarily rural, with nearby recreational areas, as well as permanent and vacation residences. The nearest NSA is several residences located approximately 2,050 feet east-northeast of the site center. This NSA is listed in table 4.11.2-1 and shown on figure 4.11.2-2. An ambient noise survey dated April 29, 2004 completed for the Burrillville Compressor Station was used to establish the existing noise levels at the compressor station location. The results of the noise study are presented in table 4.11.2-1.

Cromwell Compressor Station

The existing Cromwell Compressor Station is located in Middlesex County, Connecticut, on the north side of the Town of Cromwell. A small portion of the property is located in the Town of Rocky Hell. The Cromwell Compressor Station is located on a heavily wooded property owned by Algonquin. The nearest NSA is two residences located approximately 850 feet west of the site center. This NSA is listed in table 4.11.2-1 and shown on figure 4.11.2-3. A study of existing noise levels at the nearest NSA was conducted by H&K on October 3, 2007. The results of the noise study are presented in table 4.11.2-1.

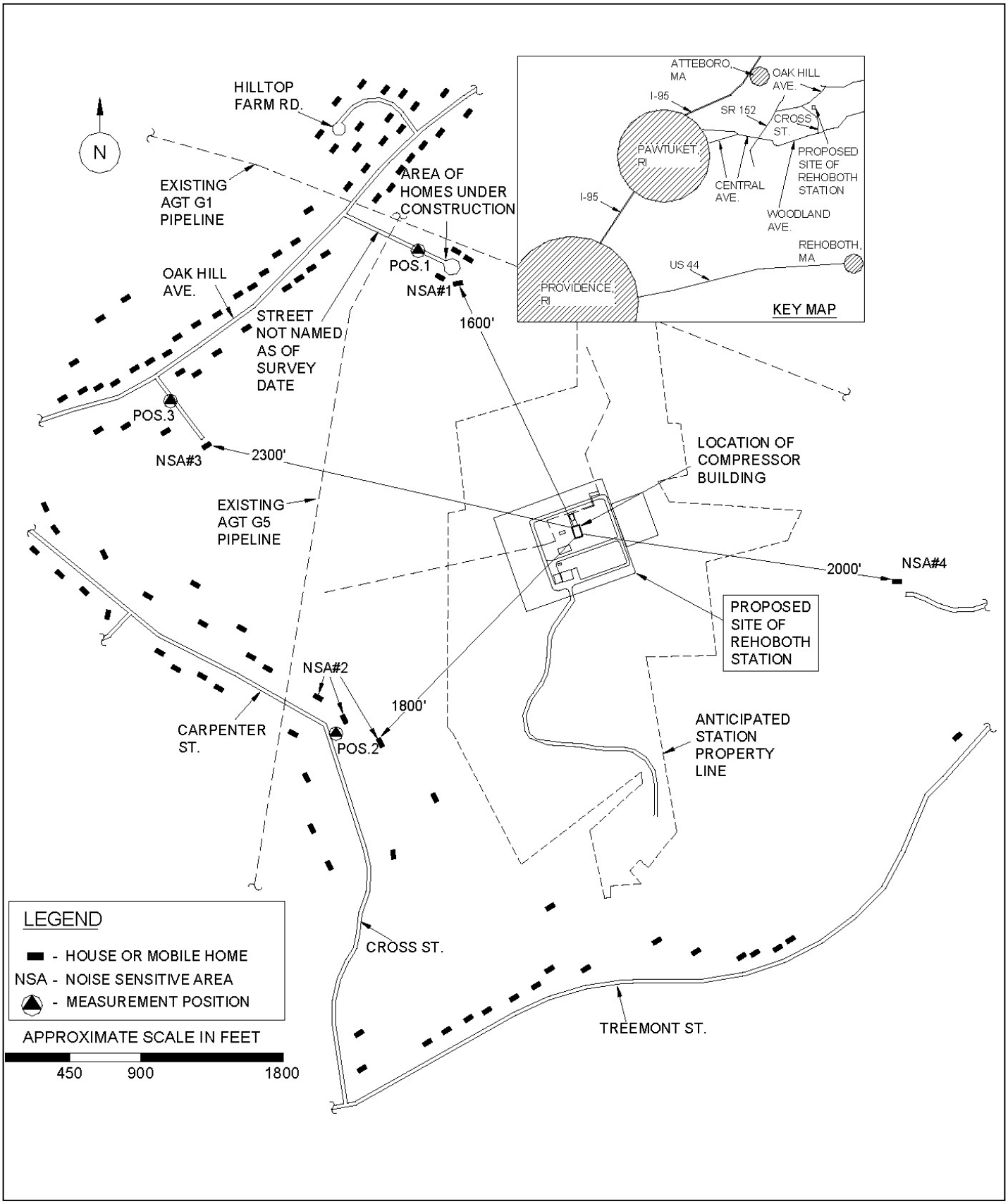

Figure 4.11.2-1
HubLine/East to West Project
Proposed Rehoboth Compressor Station Noise-Sensitive Areas

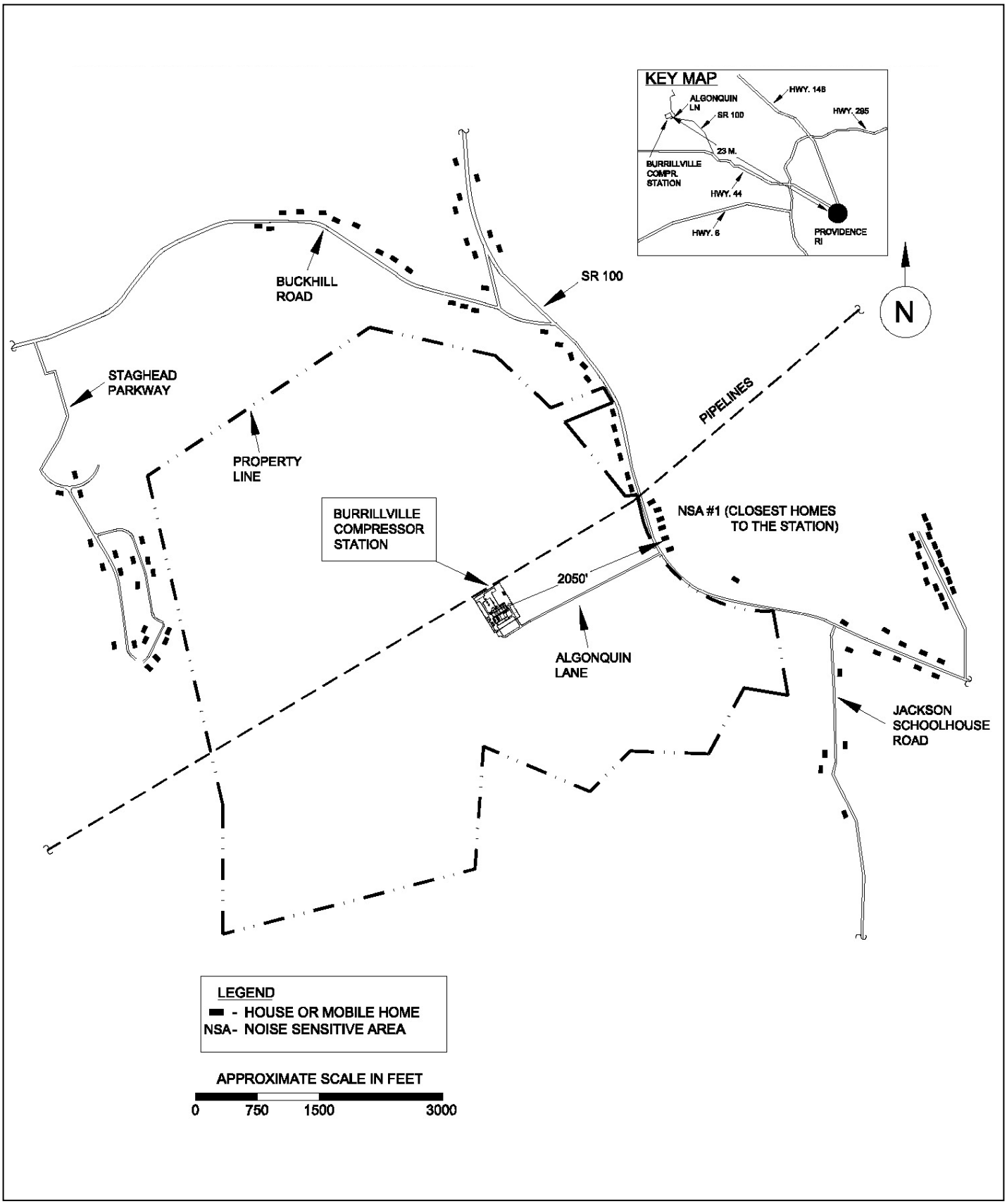

Figure 4.11.2-2
HubLine/East to West Project
Existing Burrillville Compressor Station Noise-Sensitive Areas

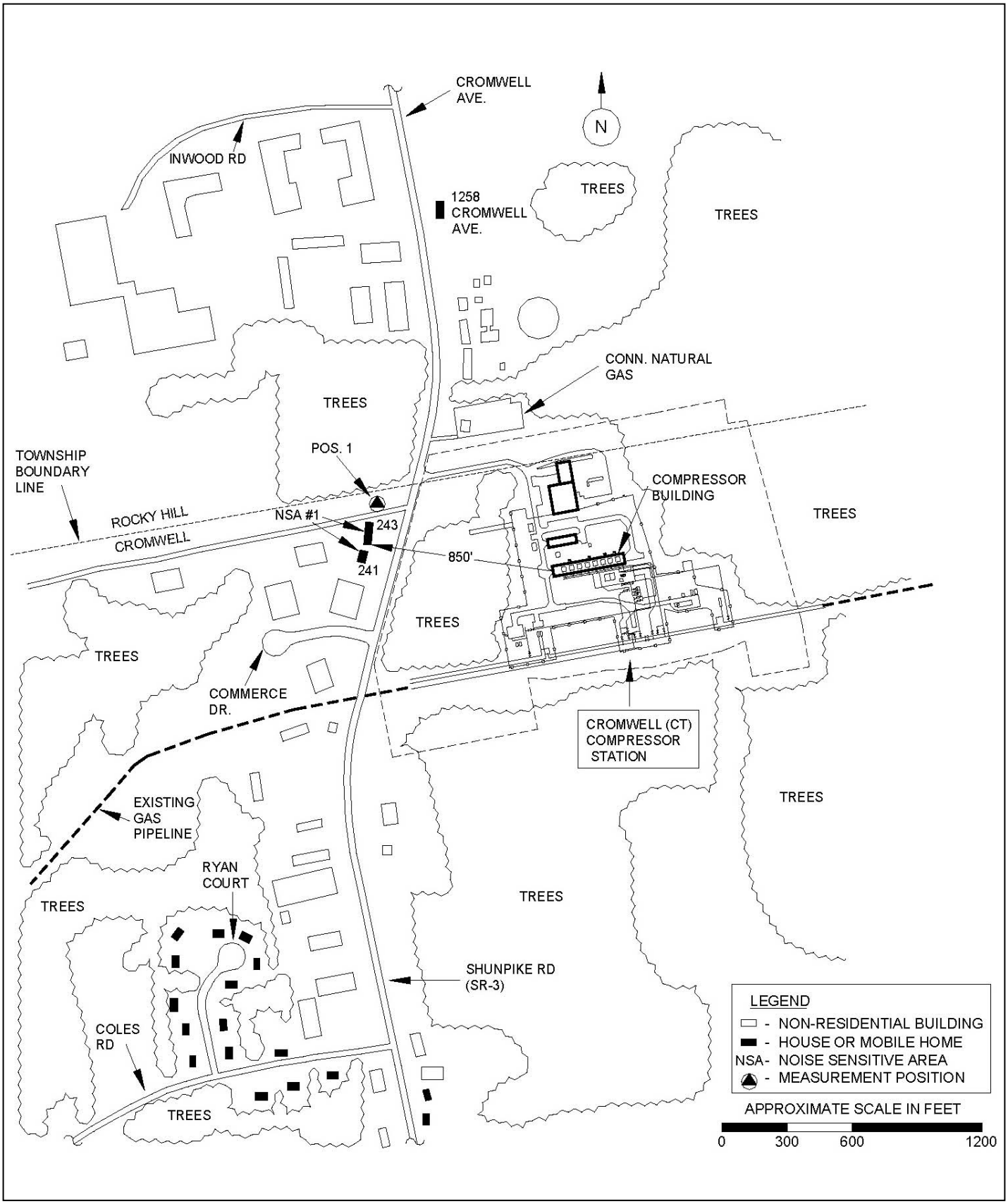

Figure 4.11.2-3
HubLine/East to West Project
Existing Cromwell Compressor Station Noise-Sensitive Areas

4.11.2.2 Noise Regulatory Requirements

Federal Noise Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This publication evaluated the effects of environmental noise with respect to health and safety. The EPA has determined that noise levels should not exceed 55 dBA L_{dn}, which is the level that protects the public from indoor and outdoor activity interference (EPA, 1974). This noise level has been useful for federal and state agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to 48.6 dBA $L_{eq(24)}$ (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA $L_{eq(24)}$ would not exceed 55 dBA L_{dn}).

The FERC has adopted the EPA guidance; therefore, the proposed Rehoboth Compressor Station and the new equipment that would be installed at the Burrillville and Cromwell Compressor Stations must comply with federal and state noise regulations. The proposed modifications to the Hanover Compressor Station would not result in a change in noise conditions at nearby receptors; therefore, no further analysis is required. Noise attributable to any compressor facility cannot exceed an L_{dn} of 55 dBA at any NSA unless the NSA is established after facility construction.

State and Local Noise Regulations

Massachusetts has established noise regulations that would apply to the proposed Rehoboth Compressor Station. The noise regulations (310 CMR Section 7.10) restrict noise sources from: 1) increasing the broadband sound level by more than 10 dB above ambient; or 2) producing a pure tone condition (i.e., when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more). These criteria are measured both at the property line and at the nearest inhabited residence. Ambient noise is defined as the L_{90} (i.e., lowest background A-weighted sound level that is exceeded 90 percent of the time). In the case of the Rehoboth Compressor Station site, the measured ambient nighttime L_{90} taken at a point nearest to the property line was 34.6 dBA; therefore, the noise level after the addition of the Rehoboth Compressor Station cannot exceed 44.6 dBA at the nearest property line. The lowest ambient nighttime L_{90} measured at an inhabited residence was 33.4 dBA; therefore, the noise level after the addition of the Rehoboth Compressor Station cannot exceed 43.4 dBA at the nearest residence. For comparison purposes, the FERC noise standard L_{eq} of 48.6 dBA for noise attributable to the compressor station discussed above is less stringent than the Massachusetts standard.

Connecticut has established noise regulations that are applicable to the existing Cromwell Compressor Station. These noise regulations (Title 22a, Part 69, Section 22a-69-1/2/3/4) establish standard noise limits emitting from a sound source, as measured at certain Noise Zones (i.e., land use category) when emitted from other Noise Zones (i.e., land use category). Table 4.11.2-2 summarizes the Noise Zone Standards that establish noise level requirements.

TABLE 4.11.2-2

Summary of Connecticut Noise Zone Standards and Noise Limits

Noise Zone/Class Emitter	Receptor Class C	Receptor Class B	Receptor Class A/Day	Receptor Class A/Night
Class C Emitter	70 dBA	66 dBA	61 dBA	51 dBA
Class B Emitter	62 dBA	62 dBA	55 dBA	45 dBA
Class A Emitter	62 dBA	55 dBA	55 dBA	45 dBA

dBA = decibels on the A-weighted scale.
Class A Noise Zone = generally defined as residential land use.
Class B Noise Zone = generally defined as commercial land use.
Class C Noise Zone = generally defined as industrial land use.

According to the Connecticut noise regulations, where mixed land use exists, the least restrictive of the class categories apply. In the case of the Cromwell Compressor Station, the noise level that corresponds to a Class C Emitter to a Receptor Class A would apply. Therefore, the station noise should not exceed 51 dBA at the adjacent Class A Noise Zone (i.e., property line of the adjacent residences). Connecticut noise regulations allow a deviation from these noise standards based upon the age of the noise-generating source. For existing noise sources constructed before 1960, a 10 dBA maximum noise level allowance is provided (i.e., L_n of 61 dBA instead of 51 dBA), and for existing noise sources constructed between 1960 and the effective date of the regulations in 1978, a 5 dBA maximum noise level allowance is provided (i.e., L_n of 56 dBA instead of 51 dBA).

The New Jersey Noise Control Act (Chapters 29, 29B) regulates noise in New Jersey. These regulations state that continuous airborne sound at a receiving residential property line cannot exceed 65 dBA during the daytime (7:00 AM to 10:00 PM) and 50 dBA during the nighttime (10:00 PM to 7:00 AM). New Jersey also has a commercial or industrial property line sound restriction of 65 dBA (day or night), as well as octave band sound pressure level restrictions that apply at residential property lines. In addition to these New Jersey noise ordinances, Hanover Township, in which the Hanover Compressor Station is located, has noise ordinances that apply to the compressor station. These ordinances require that continuous airborne sound at a residential receiver not exceed 45 dBA during the nighttime (10:00 PM to 7:00 AM). Hanover Township also has established octave band sound pressure level restrictions that apply to residential receivers. As previously noted, the modifications to the Hanover Compressor Station would not result in a change in noise conditions at nearby receptors; therefore, no further analysis is required.

There are no applicable state noise regulations for Rhode Island. In addition, there are no known local noise ordinances that would apply to the E2W Project, with the exception of the Hanover Township ordinance discussed above.

4.11.2.3 Noise Level Impacts and Mitigation

Construction Noise

Noise would be generated during construction of the pipeline and during the construction and operation of the modified aboveground facilities. Pipeline construction is similar to an assembly line, with crews conducting separate but sequential activities, each generally proceeding at rates ranging from several hundred feet to 1 mile per day. Depending on the distance between each crew in the assembly line, construction activities in any one area could last from several weeks to several months on an intermittent basis. Construction equipment would be operated on an as-needed basis during this period. While individuals in the immediate vicinity of the construction activities would experience an increase in

noise, this effect would be temporary and local. Nighttime noise is not expected to increase during construction because most construction activities would be limited to daytime hours. Algonquin has committed to implementing noise mitigation measures during construction activities, including ensuring that sound muffling devices are provided as standard, and that construction equipment is maintained in good working order. If construction-related noise disturbances occur at nearby NSAs, Algonquin would implement additional mitigation measures to minimize temporary disturbance from construction noise. Algonquin would comply with all applicable noise ordinances during construction of the proposed facilities.

Algonquin proposes to use the HDD method to cross the Weymouth Fore River in Massachusetts and the Shetucket River in Connecticut. HDD activities would typically occur on a continuous basis (i.e., 24 hours per day) until completion. Due to the proximity of the proposed HDD sites to NSAs, H&K completed noise assessments of the HDD sites to determine the existing noise levels and predicted noise levels at the nearest NSA during HDD activities. The results of these noise assessments and the distance and direction of the nearest NSA from the HDD sites are summarized in table 4.11.2-3.

TABLE 4.11.2-3

Noise Quality Analysis for the Horizontal Directional Drilling Sites

HDD Site	Distance and Direction of NSA from HDD Site	Existing Ambient L_{dn} (dBA)[a]	Predicted HDD Noise Contribution L_{dn} (dBA)	Predicted Noise Contribution + Ambient L_{dn} (dBA)	Predicted Increase in Ambient (dB)
Shetucket River HDD Entry Site	300 feet (south)	48.2	54.4[b]	55.3	7.1
Shetucket River HDD Exit Site	650 feet (southeast)	42.7	52.6	53.3	10.6
Weymouth Fore River HDD Entry Site	400 feet (northeast)	54.0	51.8[b]	56.0	2.0
Weymouth Fore River HDD Exit Site	200 feet (west-northwest)	49.8	54.5[b]	55.7	5.9

[a] Ambient L_{dn} calculated based upon measured L_d and estimated L_n.
[b] Estimated noise contribution assumes noise control measures.
NSA = noise-sensitive area.
dBA = decibels on the A-weighted scale.
dB = decibel.
L_{dn} = day-night equivalent sound level.
L_d = daytime sound level.
L_n = nighttime sound level.

The acoustical analysis completed for the HDD sites assumes that noise mitigation measures would be implemented at the Shetucket River HDD entrance point, and at the Weymouth Fore River entrance and exit points. These noise mitigation measures would include:

- installing a temporary noise barrier before commencing drilling operations;
- employing residential-grade exhaust silencers on engines associated with the operation of the HDD equipment;
- relocating equipment to provide further distance attenuation from NSAs;
- installing a secondary partial noise barrier around the hydraulic power unit; and

- restricting HDD operations to daytime only or providing temporary housing or monetary compensation for affected landowner(s).

With the implementation of these noise mitigation measures, the HDD activities should not exceed the FERC standard of 55 dBA L_{dn} at nearby NSAs.

Operational Noise

The new and modified compressor stations would generate noise on a continuous basis (i.e., 24 hours per day) once operating. The noise impact associated with the operation of these aboveground facilities would be limited to the vicinity of the facilities. The specific operational noise sources associated with these facilities and their estimated impact at the nearest NSAs are described below.

Rehoboth Compressor Station – As part of the E2W Project, Algonquin is proposing to construct the Rehoboth Compressor Station. This station would include the following major noise-generating equipment units:

- a 10,310-hp ISO-rated (8,960-hp NEMA-rated) Solar Taurus 70 natural gas-fired turbine compressor unit;
- aboveground gas piping and piping components;
- outdoor lube oil cooler;
- turbine air intake system; and
- outdoor gas aftercooler.

Algonquin completed an acoustical analysis to identify the estimated noise impacts from the proposed Rehoboth Compressor Station at the nearest NSAs, and to determine what, if any, noise control measures would be needed to ensure compliance with federal and local noise ordinances. The results of the acoustical analysis are presented in table 4.11.2-4.

The acoustical analysis presented in table 4.11.2-4 is based upon the implementation of specific noise control measures outlined in the H&K acoustical analysis dated February 12, 2008. Algonquin has indicated that it would implement all of the noise mitigation recommendations provided in the H&K acoustical analysis. These include:

- an acoustically designed building to house the turbine/compressor that includes insulated walls; only skylights to providing natural light; well-sealed access doors; and a building ventilation system with noise controlled, wall-mounted air supply fans and exhaust through roof openings;
- a two-stage, turbine exhaust muffler system;
- acoustical pipe insulation on all aboveground gas piping;
- acoustical material covering all outdoor, aboveground valves, pipe supports, and guides;
- engine noise specifications for the lube oil cooler and gas aftercooler;

- silencers for the turbine air intake system; and
- a silencer for unit gas blowdown events.

TABLE 4.11.2-4

Noise Quality Analysis for the Proposed Rehoboth Compressor Station

Location	Distance and Direction of NSA to Site Center	Existing Ambient L_{dn} (dBA)[a]	Predicted Facility Contribution L_{dn} (dBA)	Predicted Facility Contribution + Ambient L_{dn} (dBA)	Predicted Increase in Ambient (dBA)	Estimated Facility Contribution + Ambient L_{90}	Calculated Massachusetts Noise Standard L_{eq} (dBA)
NSA 1	1,600 feet (north-northwest)	42.8	39.0	45.3	1.2	36.0	43.4
NSA 2	1,800 feet (south-southwest)	44.1	37.8	45.0	0.9	35.1	42.7
NSA 3	2,300 feet (west)	41.7	35.2	42.6	0.9	32.7	40.4
NSA 4[b]	2,000 feet (east)	41.7	36.7	42.9	1.2	35.1	43.4
Property Line 1	500 feet (east)	--	--	--	--	43.9	44.6
Property Line 2	680 feet (west)	--	--	--	--	41.4	44.6
Property Line 3	680 feet (north)	--	--	--	--	41.4	44.6
Property Line 4	1,060 feet (south)	--	--	--	--	38.4	44.6

[a] Ambient L_{dn} calculated based upon measured L_d and L_n.
[b] Ambient sound level for NSA 4 was not measured but assumed to be similar to the measured sound level at NSA 3.
NSA = noise-sensitive area.
dBA = A-weighted decibel.
L_{dn} = day-night equivalent sound level.
L_d = daytime sound level.
L_n = nighttime sound level.
L_{90} = sound level exceed 90 percent of the time for a one-hour survey.

As shown in table 4.11.2-4, the proposed Rehoboth Compressor Station, using the noise control measures identified above, would comply with the FERC's noise standard of 55 dBA L_{dn}. As discussed in section 4.11.2.2, Massachusetts has specific noise standards that would apply to the compressor station property line and at the nearest inhabited residence. These standards vary based upon the measured existing sound level. As shown in table 4.11.2-4, the station would comply with Massachusetts noise regulations both at the nearest NSA and at the station property line.

In addition to the noise generated during normal station operation, periodic blowdown events would occur that would generate additional noise. Algonquin has committed to install a blowdown silencer designed to meet a sound level of 60 dBA at a distance of 300 feet during a blowdown event. This corresponds to a sound level of approximately 51.4 dBA at the nearest NSA during a blowdown event. Algonquin anticipates that blowdown events would be infrequent and occur for only a short timeframe (e.g., 1 to 5 minutes).

Burrillville Compressor Station – As part of the E2W Project, Algonquin is proposing to modify the existing Burrillville Compressor Station to include a new gas aftercooler. Algonquin completed an acoustical analysis to identify the estimated noise impacts from the proposed Burrillville Compressor Station modification at the nearest NSA, and to determine what, if any, noise control measures would be

needed to ensure compliance with federal and local noise ordinances. The results of the acoustical analysis are presented in table 4.11.2-5.

TABLE 4.11.2-5

Noise Quality Analysis for the Modifications at the Existing Burrillville and Cromwell Compressor Stations

Facility/ Location	Distance and Direction of NSA to Site Center	Estimated L_{dn} of Station at Full Capacity (dBA)	Estimated L_{dn} of the Gas Aftercooler Addition (dBA)	Estimated L_{dn} of Station at Full Load with Gas Aftercooler Addition	Predicted Increase in Ambient (dBA)
Existing Burrillville Compressor Station					
NSA 1	2,050 feet (east-northeast)	54.6 [a]	31.2	54.6	0.0
Existing Cromwell Compressor Station					
NSA 1	850 feet (west)	59.1 [b]	39.0	59.1	0.0

[a] Based upon the results of the most recent sound survey conducted in 2004 by Hoover and Keith, Inc.

[b] The estimated station contribution at the NSA was calculated using the measured L_{90}, which was deemed to be representative of the noise contributed primarily by the station equipment. An additional 3.9 dB was added to the measured levels because the station was operating at 41 percent of full capacity during the survey.

NSA = noise-sensitive area.
dBA = decibels on the A-weighted scale.
L_{dn} = day-night equivalent sound level.
L_d = daytime sound level.
L_n = nighttime sound level.

The acoustical analysis presented in table 4.11.2-5 does not assume the implementation of any additional noise control measures at the Burrillville Compressor Station. As shown in table 4.11.2-5, the existing Burrillville Compressor Station complies with the FERC's noise standard of 55 dBA L_{dn}. The proposed modifications to the compressor station would not result in an increase in the noise levels at the nearest NSA.

In addition to the noise generated during normal station operation, periodic blowdown events occur at the existing Burrillville Compressor Station that generate additional noise. Because Algonquin anticipates a decrease in operation of the Burrillville Compressor Station, the frequency of blowdown events at this station is anticipated to decrease accordingly. No change in blowdown duration is anticipated due to the compressor station modifications; typical blowdown duration is approximately 15 seconds.

Cromwell Compressor Station – As part of the E2W Project, Algonquin is proposing to modify the existing Cromwell Compressor Station to include a new gas aftercooler. Algonquin completed an acoustical analysis to identify the estimated noise impacts from the proposed Cromwell Compressor Station modification at the nearest NSA, and to determine what, if any, noise control measures would be needed to ensure compliance with federal and local noise ordinances. The results of the acoustical analysis are presented in table 4.11.2-5.

The acoustical analysis presented in table 4.11.2-5 is based upon the implementation of certain noise control measures. Algonquin has indicated that it would implement the noise mitigation recommendations provided in the acoustical analysis prepared for the proposed Cromwell Compressor Station modifications dated November 19, 2007. These recommended noise control measures include:

- use of low fan tip speeds and low noise fans; and
- use of acoustical pipe insulation for inlet side pipe risers.

The noise contribution from the existing Cromwell Compressor Station, when operated at full capacity, is estimated to exceed the FERC's noise standard of 55 dBA L_{dn}. The Cromwell Compressor Station was placed in service in November 7, 1958, which is when Compressor Units C1 and C2 were placed in service. Compressor Units C3 and C4 were placed in service in 1959, and Compressor Units C5 and C6 were placed in service in 1962. The two turbine-drive units (i.e., Units C7 and C8) were placed in service in 1982 and 1985, respectively. Algonquin is not aware of any noise complaints received due to the operation of the Cromwell Compressor Station. Because the proposed station modifications would not result in an increase in noise resulting from the station, we are not recommending additional noise mitigation measures, aside from those that Algonquin has committed to implement in association with the installation of the gas aftercooler. If landowners have a noise-related complaint associated with the operation of the Cromwell Compressor Station, they may contact the FERC using the FERC's Enforcement Hotline at (888)889-8030 or at hotline@ferc.gov.

Connecticut has also established noise regulations that apply to the Cromwell Compressor Station. As discussed in section 4.11.2.2, to demonstrate compliance with the Connecticut standard, the station noise should not exceed 51 dBA at the adjacent Class A Noise Zone (i.e., property line of the adjacent residences). Based upon sound level estimates of the Cromwell Compressor Station operating at full load, the sound level at the nearest NSA is 59.1 dBA L_{dn} (see table 4.11.2-5), which corresponds to an L_{eq} of 52.7 dBA. However, based upon the age of certain noise-generating units at the Cromwell Compressor Station, the station would be in compliance with Connecticut noise standards when operating at full load (see section 4.11.2.2).

In addition to the noise generated during normal station operation, periodic blowdown events occur at the existing Cromwell Compressor Station that generate additional noise. Because Algonquin anticipates a decrease in operation of the Cromwell Compressor Station, the frequency of blowdown events at this station is anticipated to decrease accordingly. No change in blowdown duration is anticipated due to the compressor station modifications; typical blowdown duration is approximately 15 seconds.

Hanover Compressor Station – The existing Hanover Compressor Station is located in Morris County, New Jersey. A study of the station's contribution at the nearest NSA was conducted by H&K on February 3, 2006 to address the addition of a compressor and gas aftercooler associated with the Algonquin Ramapo Expansion Project. The results of the noise study are presented in table 4.11.2-6.

TABLE 4.11.2-6

Background Noise Levels at the Nearest Noise-Sensitive Area to the Existing Hanover Compressor Station

Monitoring Location	Distance to NSA	Direction to NSA	Estimated L_{dn} of Station at Full Capacity (dBA)[a]
NSA 1	800 feet	West	48.2 dBA

[a] Existing Hanover Compressor Station sound level contribution is based on the results of the most recent sound survey and acoustical analysis completed for the station in 2006.

NSA = noise-sensitive area.
dBA = decibels on the A-weighted scale.
L_{dn} = day-night equivalent sound level.
L_d = daytime sound level.
L_n = nighttime sound level.

As shown in table 4.11.2-6, the existing Hanover Compressor Station complies with the FERC's noise standard of 55 dBA L_{dn}. New Jersey and Hanover Township have established noise regulations as described in section 4.11.2.2. These noise regulations provide specific property line noise limits based

upon the receptor type and time of day. The New Jersey standard requires that the noise levels not exceed 50 dBA L_{eq} during the nighttime at the nearest residential property boundary (10:00 PM to 7:00 AM). The most recent noise report for the Hanover Compressor Station prepared by H&K dated February 3, 2006 indicated that the sound contribution from the Hanover Compressor Station should meet the New Jersey residential property line standard. The Hanover Township noise regulations limit continuous airborne sound received at a residence to 45 dBA L_{eq} during the nighttime (10:00 PM to 7:00 AM). As shown in table 4.11.2-6, the estimated noise contribution of the station is 48.2 dBA L_{dn} at the nearest NSA, which corresponds to an L_{eq} of 41.8 dBA. Therefore, the Hanover Compressor Station noise levels are in compliance with the Hanover Township residential property line standard. However, the February 3, 2006 H&K noise report indicated that the Hanover Compressor Station noise may slightly exceed some of the maximum allowable unweighted octave-band sound pressure levels. Because the E2W Project would not add any new noise-generating sources at the Hanover Compressor Station, we are not recommending any additional noise mitigation measures to address this potential exceedance.

As discussed above, the proposed modifications to the Hanover Compressor Station associated with the E2W Project would only involve the reversal of the 30-inch-diameter mainline to accommodate bidirectional flow, which would not result in a change to the current station sound level contributions. Therefore, the modified compressor station would continue to comply with the FERC's noise standard, as well as New Jersey and Hanover Township noise regulations, with the potential exception of the unweighted octave-band sound pressure level standard discussed above.

In addition to the noise generated during normal station operation, periodic blowdown events occur at the existing Hanover Compressor Station that generate additional noise. Because Algonquin anticipates a decrease in operation of the Hanover Compressor Station, the frequency of blowdown events at this station is anticipated to decrease accordingly. No change in blowdown duration is anticipated due to the compressor station modifications; typical blowdown duration is approximately 15 seconds.

Compressor Station Summary – The operational noise levels at the new Rehoboth Compressor Station are predicted to be below the FERC guideline of 55 dBA L_{dn} at the nearest NSA. In addition, the modifications to the existing Burrillville Compressor Station are not predicted to add additional noise at the nearest NSA. These conclusions are based upon noise estimates and the implementation of specific noise mitigation measures outlined in the acoustical analyses prepared for the E2W Project. Algonquin has indicated that it would implement noise control measures as described in the noise analyses prepared for the proposed new and modified compressor stations. To confirm that noise mitigation measures are adequately implemented to ensure compliance with federal and local noise ordinances, Algonquin has committed to conducting a post-construction noise survey at the Rehoboth Compressor Station within 60 days of placing it into service. Algonquin has also committed to conducting a post-construction noise survey at the modified Burrillville Compressor Station but has not specified the timeframe within which this survey would be conducted. Because Algonquin has not specified when it would conduct the post-construction noise survey for the Burrillville Compressor Station, when it would provide the results of the post-construction noise surveys for the Rehoboth or Burrillville Compressor Station, or the steps it would follow if the noise levels at these two stations exceed an L_{dn} of 55 dBA at any nearby NSA, **we recommend that:**

- **Algonquin should make all reasonable efforts to ensure its predicted noise levels from the new Rehoboth Compressor Station and modified Burrillville Compressor Station are not exceeded at nearby NSAs and file noise surveys showing this with the Secretary no later than 60 days after placing the new and/or modified compressor stations in service. However, if the noise attributable to the operation at full load of the new and/or modified compressor stations exceeds an L_{dn} of 55 dBA at any nearby NSAs, Algonquin should file a report on what changes are needed and**

should install additional noise controls to meet the level <u>within 1 year of the in-service date</u>. Algonquin should confirm compliance with this requirement by filing a second noise survey with the Secretary <u>no later than 60 days after it installs the additional noise controls.</u>

As previously discussed, the existing Cromwell Compressor Station, when operating at full load, currently exceeds the FERC's noise standard of an L_{dn} of 55 dBA at any nearby NSA. The modifications to the Cromwell Compressor Station are not predicted to increase noise levels at the nearest NSA. This conclusion is based upon the implementation of noise mitigation measures to which Algonquin has committed. Algonquin has also committed to completing a post-construction noise survey to verify these predictions but has not specified the timeframe within which this survey would be conducted. Because Algonquin has not specified when it would conduct the noise survey, when it would provide the results of the noise survey, or the steps it would follow if the noise levels exceed the current noise levels at the Cromwell Compressor Station at any nearby NSA, **we recommend that:**

- **Algonquin should file a post-construction noise survey for the Cromwell Compressor Station <u>no later than 60 days after placing the modified units in service</u>. The results of the noise survey are to verify that the noise from all the equipment operated at full capacity does not exceed the previously existing noise levels that are at or above an L_{dn} of 55 dBA at the nearby NSAs. If any of these noise levels are exceeded, Algonquin should implement additional noise control measures to reduce the operating noise level at the NSAs to or below the previously existing noise level <u>within 1 year of the in-service date</u>. Algonquin should confirm compliance with this requirement by filing a second noise survey with the Secretary <u>no later than 60 days after it installs the additional noise controls</u>.**

<u>Remote Blow-off Valve Sites</u> – In addition to the blowdown events that would occur associated with compressor station operation, Algonquin has proposed to install new remote blow-off valve sites along the pipeline routes. As discussed in section 4.11.1.5, one remote blow-off valve site would be located adjacent to a mainline valve site near MP 1.3 on the I-10 Extension, and another remote blow-off valve site would be located adjacent to a tap at MP 15.6 of the Q-1 System, although the latter site is not identified on the E2W Project alignment sheets. These two sites would generate additional noise during the operation of the E2W Project; however, specific information regarding the potential noise impact of these facilities on nearby NSAs has not been provided by Algonquin. To ensure that the facilities would be operated in compliance with federal and local noise ordinances, **we recommend that:**

- **Algonquin should provide information related to the proposed remote blow-off valve sites that includes:**

  a. the specific location of all proposed remote blow-off valve sites and their proximity to nearby NSAs;

  b. an estimate of the potential noise impact of the remote blow-off valves on nearby NSAs, including estimated blowdown frequency and duration and estimated noise levels at NSAs during blowdown events; and

  c. a comparison of the estimated noise levels to applicable noise ordinances, and, if needed, a description of proposed mitigation measures to ensure that noise resulting from remote blowdown activities would comply with federal and local noise ordinances, including the FERC's 55 dBA L_{dn}.

Algonquin should file this information with the Secretary <u>during the draft EIS comment period</u>.

As discussed in sections 3.6.2 and 4.11.1.5, we have some concerns about the proposed location and orientation of the blow-off valve site at MP 1.3 of the I-10 Extension and its close proximity to the residences abutting Harding Avenue. The proximity of this site to residences would increase noise impacts should a blowdown occur. In section 3.6.2, we are recommending that Algonquin prepare an alternatives analysis for this proposed blow-off valve site.

4.11.3 NSTAR Alternative

The impacts of construction and operation of the NSTAR Alternative on air quality and noise levels would be similar to those of the corresponding segment of the proposed Project.

4.12 RELIABILITY AND SAFETY

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 °F and is flammable at concentrations between 5 percent and 15 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

4.12.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. The Pipeline and Hazardous Materials Safety Administration's (PHMSA), Office of Pipeline Safety (OPS) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. A state may also act as the DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement action. The majority of the states have either section 5(a) certifications or section 5(b) agreements, while nine states act as interstate agents. Massachusetts, Connecticut, Rhode Island, and New Jersey all have section 5(a) certifications.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 of 49 CFR specifically addresses natural gas pipeline safety issues.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction.

The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the E2W Project would be designed, constructed, operated, and maintained in accordance with or to exceed the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

The standards in the federal regulations become more stringent as the human population density increases. Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined as follows.

- Class 1 – Location with 10 or fewer buildings intended for human occupancy;
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy;
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period; and
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

The majority (89 percent) of the proposed pipeline facilities in Massachusetts would be located in Class 3 areas, including the entire 12.9 miles of the I-10 Extension and 5.2 miles of the Q-1 System Replacement. The remaining 2.3 miles of the Q-1 System Replacement would be located in Class 1 areas. None of the proposed pipeline routes in Massachusetts would be located in Class 2 or 4 areas.

About 4.3 miles (39 percent) of the E-3 System Replacement would be located in Class 3 areas, 4.9 miles (45 percent) would be located in Class 2 areas, and 1.8 miles (16 percent) would be located in Class 1 areas. None of the E-3 System Replacement would be located in Class 4 locations. A summary of class locations based on current population density along the proposed pipeline routes is provided in table 4.12.1-1.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock.

TABLE 4.12.1-1 **Area Classifications along the HubLine/East to West Project**			
State/Facility	Milepost Range	Length	Class Location
Massachusetts			
I-10 Extension	0.0 – 12.9	12.9	3
Q-1 System Replacement	12.2 – 12.5	0.3	3
	12.5 – 14.4	1.9	1
	14.4 – 15.7	1.3	3
	15.7 – 16.1	0.4	1
	16.1 – 19.7	3.6	3
Connecticut			
E-3 System Replacement	0.0 – 4.3	4.3	3
	4.3 – 8.9	4.6	2
	8.9 – 10.7	1.8	1
	10.7 – 11.0	0.3	2

Class locations also specify the maximum distance to mainline valves (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Spacing between the mainline valves for the E2W Project would meet the DOT requirements for the appropriate class location. Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Pipe design specifications for the E2W Project are provided in table 4.12.1-2.

TABLE 4.12.1-2 **Pipe Design Specifications for the HubLine/East to West Project**					
Class Location	Pipe Wall Thickness (inches)	Design Factor	Grade	Material Specification	Manufacturing Process
1	0.412	.72	X70	API 5L	DSAW
2	0.412	.6	X70	API 5L	DSAW
3	0.500	.5	X70	API 5L	DSAW
Source: Title 49 CFR Part 192					

If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the pipeline, Algonquin would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness to comply with the DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the Nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December 2002. No later than December 17, 2004, gas transmission operators must develop and follow a written Integrity Management Program (IMP) that contains all of the elements described in Part 192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law establishes an IMP that applies to all high consequence areas (HCAs). The DOT (68 Federal Register (FR) 69778, 69 FR 18228, and 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in Part 192.903 of the DOT regulations.

The OPS published a series of rules from August 6, 2002 to May 26, 2004 (69 FR 29903), that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and

requires an IMP to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in Title 49, USC 60109 for the OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 locations where the potential impact radius[7] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[8] or
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.[9]

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its IMP to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the IMP at Part 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years. The HCAs have been determined based on the relationship of the pipeline centerline to other nearby structures and identified sites. About 60 percent of the area along the proposed pipeline routes would be classified as HCAs, including all 12.9 miles of the I-10 Extension, 5.2 miles of the Q-1 System Replacement, and 0.6 mile of the E-3 System Replacement. Table 4.12.1-3 lists by milepost the HCAs that would be crossed by the pipeline facilities and the number of sensitive receptors (e.g., residences, schools, hospitals, and churches) within the corresponding milepost range. Algonquin has identified 88 residences and 1 school within 100 feet of the construction work area within the HCAs crossed by the proposed routes.

As previously discussed, the E2W Project would be designed and constructed in accordance with or to exceed the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192 including more stringent requirements in designated class areas or HCAs. In constructing the pipelines, Algonquin would use specified welding protocol and hydrostatic testing to ensure the integrity of the pipeline, and pipeline coating and cathodic protection systems to meet requirements established by the DOT for protection of metallic facilities from external, internal, and atmospheric corrosion (see section 2.3.1). The pipeline coating would consist of a factory-applied epoxy which, when properly applied, has been shown to be effective in preventing the occurrence of stress corrosion cracking on pipelines. Algonquin would inspect all welds and use a non-destructive method such as radiographic or ultrasonic inspections to ensure pipeline structural integrity and compliance with the applicable DOT regulations. Those welds that do not meet established specifications would be repaired or replaced. Once the welds are approved, the welded joints would be coated with a protective coating and the entire pipeline would be visually inspected for any faults, scratches, or other coating defects. Any damage would be repaired before the

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7 The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in pounds per square inch multiplied by the pipeline diameter in inches.

8 The potential impact circle is a circle of radius equal to the potential impact radius.

9 An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

pipeline is installed. Upon completion of construction, the integrity of the pipelines would be verified by hydrostatic testing as described in section 4.3.2.10. The cathodic protection system would impress a low voltage current on the pipelines to offset natural soil and groundwater corrosion potential during Project operation. The functional capability of the cathodic protection system would be inspected frequently to ensure proper operating conditions for corrosion mitigation.

TABLE 4.12.1-3

Location of High Consequence Areas along the HubLine/East to West Project

State/Facility	Beginning Milepost	Ending Milepost	Length	Number of Sensitive Receptors
Massachusetts				
I-10 Extension	0.0	12.9	12.9	49
Q-1 System Replacement	12.2	12.6	0.4	0
	14.4	15.9	1.5	2
	16.3	19.6	3.3	26
Connecticut				
E-3 System Replacement	2.4	2.6	0.2	7
	3.0	3.4	0.4	4
Total	---	---	18.7	88

After construction and as required by DOT regulations, the pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would indicate the presence of the pipeline and provide a telephone number and address where a company representative could be reached in the event of an emergency or before any excavation in the area of the pipeline by a third party. Algonquin participates in the "Call Before You Dig" and "One Call" programs and other related pre-excavation notification organizations in the states in which it operates.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Part 192.615, each pipeline operator must establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of Algonquin's emergency plan (under Part 192.615) include:

- receiving, identifying, and classifying emergency events such as gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown of system and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards; and

Algonquin maintains a monitoring system that includes a gas control center that monitors system pressures, flows, and customer deliveries on its entire system. The center is staffed 24 hours a day, 7 days a week, 365 days a year from Houston, Texas. Algonquin also staffs area and sub-area offices along its pipeline routes with personnel who can provide the appropriate response to emergency situations and direct safety operations as necessary. Furthermore, Algonquin's pipeline systems are equipped with remote control valves that can be operated remotely by the gas control center. In the event of an emergency, usually evidenced by a sudden loss of pressure, the remote control valves allow for a section of pipeline to be isolated from the rest of the system. Data acquisition systems are also present at all of Algonquin's meter stations; if system pressures fall outside a predetermined range, an alarm is activated and notice is transmitted to the gas control center. Algonquin would incorporate the E2W Project into its existing gas monitoring and control systems.

Weekly aerial and monthly ground inspections by pipeline personnel would identify soil erosion that may expose the pipe; dead vegetation that may indicate a leak in the line; conditions of the vegetative cover and erosion control measures; unauthorized encroachment on the right-of-way such as buildings and other substantial structures; and other conditions that could present a safety hazard or require preventive maintenance or repairs. Algonquin would also perform annual leak detection surveys of the proposed pipeline facilities. These surveys would be instrumental in early detection of leaks and would reduce the likelihood for pipeline failure.

Algonquin representatives would meet with the emergency services departments of the municipalities and counties along the proposed pipeline route on an ongoing basis as part of its liaison program. Algonquin would provide these departments with emergency numbers and verbal, written, and mapping descriptions of the pipeline system.

This liaison program would identify the appropriate fire, police, and public officials and the responsibilities of each organization that may respond to a gas pipeline emergency, and coordinate mutual assistance in responding to emergencies. A liaison with public authorities and local utilities would be maintained in all locations along the pipeline. A current list of those to be contacted is maintained and includes the Area Manager at Algonquin's Westwood Office, the Area Supervisor at its Dighton Office in Massachusetts, the Area Manager at Algonquin's Cromwell Office in Connecticut, and the Area Supervisor at its Burrillville Office in Rhode Island. Key elements of the Algonquin liaison program that would be used for the E2W Project are as follows:

- Contact would be made with the police and fire departments and/or public officials of all communities that include Algonquin facilities in order to accomplish the following:
    - ascertain how the officials may be able to assist Algonquin during an emergency, including the determination of the jurisdiction and/or responsibility with resources that may be involved in a response to an emergency;
    - acquaint the officials with how Algonquin responds to an emergency on its pipeline system;
    - notify the officials of the types of pipeline emergencies for which they would be contacted; and
    - inform them how Algonquin, in working with their departments, would cooperate in mutually assisting in protecting life or property during an emergency.

- Police and fire departments and public officials would be given maps that show the location of Algonquin's pipelines within the boundaries of their towns.

- To enable Algonquin to quickly establish contact with police or fire departments and public officials in the event of an emergency at any location on the pipeline system, a current listing of their telephone numbers would be maintained. This listing would be reviewed on a periodic basis and necessary revisions would be made.

- Algonquin would invite fire companies to participate in periodic fire demonstrations, with emphasis placed on the following:

  - when and when not to extinguish a natural gas fire during an emergency;
  - how to extinguish different types of natural gas fires; and
  - conduct periodic emergency simulation exercises.

- Algonquin would continue to participate, on an invitational basis, in meetings with fire departments in communities in which the Algonquin facilities are located. The following subjects would be emphasized at these meetings:

  - the Algonquin role in emergencies on its pipeline systems;

  - the properties of natural gas and precautionary measures around an emergency; and

  - the local fire company's participation during an emergency on the Algonquin system.

- Algonquin would maintain a liaison with gas distribution companies and other customers. Because Algonquin would not be performing direct education to the public in areas franchised to gas distribution companies or other customers, liaisons would be maintained with these companies. The purpose of these liaisons would be to provide a contact when the occurrence of a real or potential emergency on an Algonquin facility is recognized. In order to maintain such a liaison, the following steps would be taken on a periodic basis:

  - all gas distribution companies having franchise areas in which an Algonquin pipeline is located, or Algonquin end use customers, would be supplied maps showing the location of the Algonquin pipeline in their area. The maps, showing the Algonquin emergency telephone numbers, would be transmitted to the person in charge of the distribution company's or end user's operations; and

  - a current listing of each distribution or end use customer company's emergency telephone numbers and key personnel would be maintained by Algonquin.

Algonquin would implement various public safety measures during construction in residential areas including but not limited to: fencing the construction work area boundary to ensure equipment, materials, and spoil remain in the construction right-of-way and that the public is excluded from hazardous areas; ensuring piping is welded and installed as quickly as reasonably possible consistent with prudent pipeline construction practices to minimize the duration of construction within a neighborhood; backfilling the trench as soon as the pipe is laid or temporarily installing a steel plate over the open trench; and completing final cleanup and installation of permanent erosion control measures within 10

days after the trench is backfilled, weather conditions permitting. In addition, Algonquin has developed site-specific residential construction plans for all residences within 25 feet of the construction workspace. These plans are discussed in section 4.8.3.1 and included in Appendix J. Algonquin does not anticipate the need for a night watchman along the pipeline right-of-way during construction but would secure such services if the need arises.

We received scoping comments expressing concern regarding the safety of the proposed Rehoboth Compressor Station. All of the proposed facilities, including the Rehoboth Compressor Station, would be designed, constructed, and operated to meet or exceed the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192, which are protective of public safety. The 10.3-acre facility would be located on a 97.0-acre parcel consisting primarily of forest land. The area not occupied by the compressor station facilities would be preserved as screening and buffering between the facilities and surrounding properties. Access to the facility would be controlled during construction, and a night watchman would be present at the facility. During operation, the Rehoboth Compressor Station would be secured with chainlink fencing and staffed Monday through Friday from 7:00 AM to 3:30 PM. As discussed above, the facility would be integrated into Algonquin's automated gas monitoring system that is staffed 24 hours a day, 365 days a year. Should an after-hours emergency occur, a company representative would be onsite within 30 minutes to assess the situation and coordinate the appropriate response with local emergency responders. Algonquin would notify local police, fire, town officials, and all residents within a 0.25-mile radius of the facility of any scheduled maintenance operations that would cause unusual noise or odor.

Algonquin holds periodic training sessions to review operating and emergency procedures with operations employees. These sessions include safe operation of facilities, including meter stations and compressor stations; safe operation of pipeline valves and other equipment; hazardous material handling procedures; public liaison programs; and general operating procedures. The proposed E2W Project facilities would be operated and maintained in accordance with these procedures. Algonquin employs well qualified personnel whose credentials are in accordance with Massachusetts and Connecticut safety standards.

Should Algonquin personnel need to conduct excavation activities on the right-of-way, Algonquin would notify the affected landowners and "Dig Safe" of the proposed work. In addition, Algonquin would perform an annual mailing to all landowners within 660 feet of the pipeline. The mailing would provide information on pipeline safety and contact information and provide a response card in case the landowner had any specific questions to be addressed.

4.12.2 Collocation Within and Adjacent to the NSTAR Right-of-Way

NSTAR has raised safety and reliability concerns associated with the proposed I-10 Extension, where approximately 3.9 miles (30 percent) of the pipeline would be located inside of NSTAR's existing powerline right-of-way and an additional 3.8 miles (29 percent) would be located outside of, but generally adjacent to, NSTAR's right-of-way.

One of NSTAR's concerns is that construction of the proposed pipeline could damage its existing facilities through the use of blasting and heavy equipment near transmission towers and overhead lines, which would impact the reliability of its electric transmission system. In response to NSTAR's concerns, Algonquin modified the alignment of the I-10 Extension to minimize proximity to existing towers and overhead lines (see section 3.5). Algonquin has also committed to maintaining a buffer of at least 5 feet between the construction work area and the base of all NSTAR towers, although the alignment sheets filed by Algonquin do not depict the buffer in all cases. In addition, Algonquin would implement special construction techniques to minimize the potential for construction activities to damage NSTAR's

facilities. These special construction techniques are described in section 2.3.2. Algonquin plans to collect additional geotechnical information along the proposed route and would refine or modify the proposed construction methods in proximity to NSTAR's towers, if necessary. Any blasting that may be necessary in NSTAR's right-of-way would be conducted in accordance with Algonquin's Blasting Plan (see Appendix K) that requires, among other things, that blasting be conducted by a certified blast engineer. Algonquin has also committed to developing site-specific blasting plans for those locations where blasting would occur near existing electric transmission towers.

Another concern identified by NSTAR is the potential for its use of heavy equipment during emergency and normal maintenance procedures to damage the proposed pipeline, potentially affecting worker safety and the reliability of both the natural gas and electric transmission systems. NSTAR is further concerned that the simultaneous use of the existing, limited access points to the right-of-way by both operators during an emergency could impede emergency response actions. In response to these concerns, Algonquin states that it currently operates its existing pipeline system in shared rights-of-way with NSTAR and other electric transmission companies, and that it works with electric utilities to ensure that the design of its pipelines is compatible with their needs for construction and maintenance of their facilities. Algonquin has requested information from NSTAR regarding the weight of the equipment that would be used, and has proposed to provide equipment crossing points along the pipeline that would allow NSTAR access across the pipeline. In these areas, Algonquin would implement measures such as deeper pipe burial or the use of thicker-walled pipe to ensure the integrity of the pipeline.

NSTAR is also concerned that collocating the proposed pipelines in close proximity to high voltage electric transmission facilities would pose a safety risk associated with ground faults, lightning striking the electrical towers, and broken live wires near or on the ground. Electrical discharges to the ground and then to the pipeline under these circumstances could be catastrophic unless measures are implemented to mitigate these risks. There is also a safety risk associated with operating pipeline construction equipment in close proximity to high voltage powerlines. In response to these concerns, Algonquin revised the alignment of the I-10 Extension to increase the separation of the pipeline and the construction work area from the electric transmission facilities. Algonquin states that it met with NSTAR on two occasions to specifically discuss NSTAR's electrical safety concerns and has committed to continuing a dialogue with NSTAR on electrical safety issues. In addition, Algonquin provided preliminary information regarding how it would mitigate electrical risks, such as using lightning arrestors along with decoupling devices to protect the pipeline against electrical surges, or zinc ribbon buried parallel to and near the pipeline to mitigate excessive electrical potentials due to both inductive and conductive interference. Algonquin has also committed to employing an electrical engineer specializing in alternating current mitigation to develop a detailed voltage mitigation plan for the E2W Project.

In conclusion, collocation of natural gas transmission pipelines and electric transmission facilities presents unique safety challenges but is not without precedent, including Algonquin's original Q-1 system pipeline, which is located within approximately 50 feet of 24 NSTAR towers, with the nearest tower being offset by approximately 30 feet. It is our opinion that the proposed I-10 Extension could also be safely installed and operated without compromising the integrity or reliability of NSTAR's existing facilities or public safety by implementing the construction measures described by Algonquin, together with continued communication between Algonquin and NSTAR. To ensure this, **we recommend that:**

- **Algonquin should file the following information related to the collocation of its facilities with the NSTAR facilities:**

  a. revised alignment sheets depicting a buffer of at least 5 feet between construction work areas and all NSTAR towers;

b. the results of its future geotechnical investigation of the NSTAR right-of-way and any revisions to its estimated locations where blasting would likely be necessary in or adjacent to NSTAR's right-of-way;

c. site-specific blasting plans for those areas where the pipelines would be 50 feet or less from an existing tower foundation, including the subsurface extent of the foundations;

d. site-specific construction plans for those areas where the pipelines would be 50 feet or less from an existing tower foundation, including the subsurface extent of the foundations and where special construction procedures would be used to protect the integrity of NSTAR's facilities; and

e. an update of its ongoing communications with NSTAR regarding safety and reliability issues, including any modifications to proposed construction methods, right-of-way access issues, and electrical risk mitigation measures that result from these discussions.

Algonquin should file this information with the Secretary <u>during the draft EIS comment period</u> for analysis in the final EIS.

4.12.3 Pipeline Accident Data

Since February 9, 1970, Title 49 CFR Part 191 has required all operators of transmission and gathering systems to notify the DOT of any reportable incident and to submit a report on form F7100.2 within 20 days of the incident. Reportable incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both, of a total of $5,000 or more;
- required immediate repair on a transmission line;
- occurred while testing with gas or another medium; or
- in the judgment of the operator was significant, even though it did not meet the above criteria.

The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. Since that date, operators must only report incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. Table 4.12.3-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2007, recognizing the difference in reporting requirements. The 14.5-year period from 1970 through June 1984, which provides a larger universe of data and more basic report information than subsequent years, has been subject to detailed analysis, as discussed in the following sections.

TABLE 4.12.3-1

Natural Gas Service Incidents by Cause

Cause	Incidents per 1,000 miles of pipeline (percentage)	
	1970-1984	1986-2007
Outside force	0.70 (53.8)	0.09 (36.0)
Corrosion	0.22 (16.9)	0.06 (23.1)
Construction or material defect	0.27 (20.8)	0.04 (15.4)
Other	0.11 (8.5)	0.06 (23.1)
Total	1.30	0.25

Source: D.J. Jones, G.S. Kramer, D.N. Gideon, and R.J. Eiber. 1986. "An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines 1970 Through June 1984." NG-18 Report No. 158, Pipeline Research Committee of the American Gas Association.

During the 14.5-year period, 5,862 service incidents were reported over the more than 300,000 total miles of natural gas transmission and gathering systems nationwide. Service incidents, defined as failures that occur during pipeline operation, have remained fairly constant over this period with no clear upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline before operation.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.3-1 provides a percentage distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.8 percent of all service incidents between 1970 and 1984. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.3-2 shows the frequency of the natural gas service incidents by cause for 1986-2007. This table also demonstrates that the majority of incidents are caused by outside forces.

TABLE 4.12.3-2

Natural Gas Service Incidents by Cause (1986-2007) [a]

Cause	1986-2001 (percent)	2002-2007 (percent)
Outside Force [b]	35.3	72.8
Corrosion [c]	24.0	1.9
Construction Activity or Material Defect [d]	14.4	7.5
Other [e]	26.3	17.8
Total	100.0	100.0

[a] Source: DOT, 2008c.
[b] Outside Force includes: car, truck, or other vehicle not related to excavation activity, earth movement, fire/explosion, heavy rains/floods, high winds, incorrect operation, lightning, temperature, third-party excavation damage, and vandalism.
[c] Corrosion includes: internal and external corrosion.
[d] Construction Activity or Material Defect includes: body of pipe, component, joint, malfunctions of control/relief equipment, rupture of previously damaged pipe, ruptured or leaking seal/pump packing, threads stripped, and broken pipe couplings.
[e] Other: Miscellaneous.

The pipelines included in the data set in table 4.12.3-1, vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, because corrosion is a time-dependent process. Further, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 4.12.3-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data show that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12.3-3

External Corrosion by Level of Control (1970-1984)

Corrosion Control	Incidents per 1,000 miles per Year
None -bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

Source: DOT, 2008c.

4.12.4 Impact on Public Safety

The service incident data summarized in table 4.12.3-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as leaks, and the remaining third classified as ruptures, implying a more serious failure.

Table 4.12.4-1 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2007. Fatalities between 1970 and June 1984 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Of the total 5.0 nationwide average, fatalities among the public averaged 2.6 per year over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees. However, the data show that the total annual average for the period 1984 through 2007 decreased to 3.5 fatalities per year. Subtracting two major offshore incidents in 1989, which do not reflect the risk to the onshore public, yields a total annual rate of 2.8 fatalities per year for this period.

TABLE 4.12.4-1

Annual Average Fatalities – Natural Gas Transmission and Gathering Systems [a, b]

Year	Employees	Nonemployees	Total
1970-June 1984	2.4	2.6	5.0
1984-2007 [c]	-	-	3.5
1984-2007 [c]	-	-	2.8 [d]

[a] 1970 through June 1984 - American Gas Association, 1986.
[b] DOT Hazardous Materials Information System.
[c] Employee/nonemployee breakdown not available after June 1984.
[d] Without 18 offshore fatalities that occurred in 1989 (11 fatalities resulted from a fishing vessel striking an offshore pipeline and 7 fatalities resulted from an explosion on an offshore production platform).

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.4-2 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Nevertheless, the average 3.0 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude (100 times) lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

TABLE 4.12.4-2

Nationwide Accidental Deaths [a]

Type of Accident	Fatalities
All accidents	101,500
Motor vehicles	44,800
Falls	16,200
Poisoning	13,900
Drowning	2,900
Fires, flames, smoke	2,600
Suffocation	1,200
Tornado, flood, earthquake, etc. (1984 to 1993 average)	181
Natural gas transmission and gathering pipeline reportable incidents (1986-2007) [b]	3

[a] All data, unless otherwise noted, reflect 2003 statistics from the National Safety Council (2004).
[b] DOT, 2008a.

The available data show that natural gas pipelines continue to be a safe, reliable means of energy transportation. Based on approximately 320,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.01 per year per 1,000 miles of pipeline. Using this rate, the pipeline facilities associated with the E2W Project might result in a public fatality about every 3,200 years. This would represent only a slight increase in risk to the nearby public.

4.12.5 Terrorism

Safety and security concerns have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. The Office of Homeland Security is tasked with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks

within the United States. The Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

The Commission is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, energy facility design plans and location information have been removed from its website to ensure that sensitive information filed under Critical Energy Infrastructure Information is not readily available (RM02-4-000 and PL02-1-000 issued February 20, 2003).

The likelihood of future acts of terrorism or sabotage occurring at the proposed Project facilities, or at any of the myriad natural gas pipeline or energy facilities throughout the United States is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such future acts.

4.12.6 NSTAR Alternative

If the NSTAR Alternative were constructed, it would result in 0.8 less mile of pipeline than the corresponding segment of the I-10 Extension. The construction work area for the NSTAR Alternative would be located within 50 feet of one residence/structure, whereas the corresponding facilities would be located within 50 feet of nine residences/structures. During the scoping period, we received numerous comments expressing concern about the proximity of the NSTAR Alternative, which at that time was part of the proposed route, to the New England Sinai Hospital and the Dawe Elementary School. The hospital and school would be located 700 feet and 300 feet from the NSTAR Alternative, respectively. Operation of the NSTAR Alternative would not substantially alter the potential effects of the E2W Project on public safety.

4.13 CUMULATIVE IMPACTS

Cumulative impacts may result when the environmental effects associated with a proposed project are superimposed on, or added to, either temporary (construction-related) or permanent (operation-related) impacts associated with past, present, or reasonably foreseeable future projects. Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant.

Table 4.13-1 lists present or reasonably foreseeable future projects or activities that may cumulatively or additively impact resources that would be affected by construction and operation of the E2W Project. Construction schedules of the future projects depend on factors such as economics, funding, and regulatory considerations. Projects and activities included in this analysis are generally those of comparable magnitude and nature of impact, and are located within the same municipalities that would be affected by the E2W Project. With some exceptions, more geographically distant projects are not assessed because their impact would generally be localized and, therefore, would not contribute significantly to cumulative impacts in the proposed project area.

Geology and Soils

The facilities associated with the E2W Project are expected to have a temporary but direct impact on near-surface geology and soils. Impacts on geology and soils could lead to poor revegetation potential and indirectly affect wildlife and aquatic resources as a result of poor vegetative cover and increased erosion and sedimentation. The soil stabilization and revegetation requirements included in Algonquin's E&SCP (see Appendix F) would prevent or minimize any indirect impacts. Because the direct effects would be highly localized and limited primarily to the period of construction, cumulative impacts on geology and soils would only occur if other projects are constructed at the same time and place as the proposed facilities. The construction of some of the projects listed in table 4.13-1 would coincide with the schedule proposed for the E2W Project. Projects that require significant excavation or grading such as electric transmission line and natural gas pipeline projects would also have temporary, direct impacts on near-surface geology and soils. While there would be the potential for cumulative impacts on geology and soils if the projects would be in close proximity and constructed concurrently with the E2W Project, any cumulative impact on these resources would be minimized by the implementation of erosion control and restoration measures during the construction and restoration of the projects. Consequently, any potential cumulative impacts on geological resources and soils would be temporary and minor.

Waterbodies and Wetlands

The E2W Project would require the crossing of 22 perennial waterbodies and approximately 17 intermittent waterbodies. The Project would not involve the construction of permanent diversions or dams and, therefore, is expected to have only temporary impacts on surface water quality. The greatest potential impacts of pipeline construction on surface waters would result from an increase in sediment loading to surface waters and an increase in internal sediment loading due to channel/floodplain instability as a result of a change in erosion/deposition patterns. The level of impact of the proposed Project on surface waters would depend on precipitation events, sediment loads, stream area/velocity, channel integrity, and bed material.

TABLE 4.13-1

Existing or Proposed Activities Cumulatively Affecting Resources of Concern for the HubLine/East to West Project

State/Project	Municipality	Description	Anticipated Construction Schedule	Potential for Cumulative Impact [a]
Massachusetts				
Tirrell Woods Residential Development	Weymouth	46-unit clustered multi-family residential development.	November 2008 anticipated start date; November 2010 anticipated end date.	Yes
New Great Pond Water Treatment Plant	Weymouth	New water treatment facility and modifications to existing facilities.	Fall 2008 anticipated start date; July 2009 anticipated end date.	Yes
South Shore Hospital-Cancer Center and Parking Garage	Weymouth	Three-story Cancer Center and six-story parking garage with associated grading and drainage improvements.	Construction ongoing; October 2009 anticipated end date.	Yes
Naval Air Station Reuse Plan	Weymouth	Redevelopment of an existing naval air station for commercial/residential use.	Construction currently ongoing for Phase 1A of three phases; 12-year construction to be completed in 2020.	Yes
Thomas A. Watson Generating Station	Braintree	New electric generating station adjacent to the Weymouth Fore River.	Construction ongoing; scheduled for completion in March 2009.	No
Sharon Commons Lifestyle Center	Sharon	Commercial retail and office development.	Construction ongoing; scheduled for completion in September 2009.	Yes
Ponkapoag Pond Dam Rehabilitation	Canton	Rehabilitation of an existing earthen dam.	Scheduled for completion in December 2008.	No
Neponset Street Water Treatment Facility	Canton	New water treatment facility and modifications to existing facilities.	Scheduled for completion in December 2009.	Yes
345 kV Transmission Reliability Project	Stoughton, Canton	Installation of 18 miles of a new, underground 345 kV transmission line from the Stoughton/Canton area north to South Boston.	Construction ongoing; scheduled for completion in the Spring of 2009.	No
Manitook Estates	Rehoboth	37 single family residential lots and 0.8 mile of new roads.	Anticipated construction start date of January 2008; scheduled for completion in September 2011.	Yes
Connecticut				
MGM Grand at Foxwoods Expansion	Ledyard	An approximate 45-acre addition to the existing Foxwoods Resort and Casino complex.	Construction completed in May 2008.	No
New Jersey				
Ramapo Expansion	Hanover	Construct facilities necessary to transport natural gas from western and upstate New York to New York City markets.	Construction ongoing; scheduled for completion in November 2008.	No

[a] We determined that there would be a potential for cumulative impact if construction of the E2W Project would occur during the same timeframe as the other projects evaluated.

The highest levels of sediment would be generated by the use of the wet open-cut method, which Algonquin plans to use for 29 of the 39 proposed waterbody crossings. Less sediment would be generated where dry crossing techniques such as the flume or dam and pump method are employed, and direct sediment impacts would be entirely avoided where the HDD method or horizontal boring is used. Where the flume or dam and pump method is used, temporary construction-related impacts would be limited primarily to short periods of increased turbidity before installation of the pipeline, during the installation of the upsteam and downstream dams, and following installation of the pipeline when the dams are pulled and flow across the restored work area is re-established.

Algonquin proposes to cross the Weymouth Fore River and Shetucket River using the HDD crossing method, which would avoid direct in-stream effects. While there would be no in-stream construction if these rivers were to be crossed using the HDD method, there would be the potential for impacts on these waterbodies if an inadvertent release of drilling mud (frac-out) were to occur during the crossing. Algonquin has prepared an HDD Contingency Plan (see Appendix I) that describes the agency notification procedures and the corrective action and cleanup procedures that would be followed in the event of a frac-out and the procedures that would be followed if it is necessary to abandon the drill hole. Implementation of Algonquin's HDD Contingency Plan would reduce the potential impact of a frac-out in the Weymouth Fore and Shetucket Rivers.

Runoff from construction activities near waterbodies could also result in cumulative impacts, although this effect would be relatively minor and would be controlled by implementation of erosion and sediment control measures and by compliance with federal, state, and local requirements. Additionally, indirect economic impacts on individuals and/or communities could result if surface waters were to become contaminated and/or limitations were placed on the beneficial uses (e.g., fishing, recreation, and agricultural livestock watering) of the affected waters. However, the potential for contamination during the construction of the E2W Project would be minor and would be further minimized by implementation of Algonquin's SPCC Plan (see Appendix G).

Most of the projects listed in table 4.13-1 are located within the watersheds crossed by the E2W Project, and some of these projects (e.g., Ponkapoag Pond Dam Rehabilitation, 345 kV Transmission Reliability Project, and the Ramapo Expansion) could potentially result in impacts on surface waters; however, water quality impacts resulting from construction of the proposed Project, if any, would be temporary.

Although there is the potential that cumulative impacts could result if the E2W Project were constructed in addition to other projects listed in table 4.13-1, the geographic extent and duration of disturbances caused by construction of the E2W Project would be minimal and further minimized by the implementation of Algonquin's E&SCP and SPCC Plan. Therefore, the collective effects of these projects on surface water resources are expected to be minor.

Impacts on wetlands would result from construction of the proposed Project and potentially some of the other reasonably foreseeable future projects. The E2W Project would result in the permanent fill of 0.1 acre of wetlands for the installation of a permanent access road. In addition, the proposed Project would result in the conversion of approximately 4.4 acres of forested wetlands into emergent or scrub-shrub wetlands as a result of vegetation maintenance of the permanent cleared right-of-way. The remaining wetlands affected by the E2W Project would be restored following construction and would likely revegetate within 2 to 3 years. Therefore, construction and operation of the E2W Project would not contribute to cumulative long-term impacts on wetlands within the region.

Vegetation, Wildlife and Habitat, and Aquatic Resources

When projects are constructed at or close to the same time, they could have a cumulative impact on vegetation and wildlife occurring in the area. Right-of-way clearing and grading and other construction activities associated with the E2W Project, along with the utility and commercial/residential development projects listed in table 4.13-1 would result in the removal of vegetation; alteration of wildlife habitat; displacement of wildlife; and other potential secondary effects such as increased population stress, predation, and the establishment of invasive plant species. These effects would be greatest where the other projects are constructed within the same timeframe and area as the proposed Project and where the recovery time of the vegetation/habitat is equal to that of the Project (i.e., long term). Algonquin's proposal to locate the majority of its right-of-way within or adjacent to existing previously disturbed rights-of-way would minimize the areas of previously undisturbed vegetation that would be affected and thereby reduce potential additional cumulative impacts on vegetation communities and wildlife habitats. Implementation of Algonquin's E&SCP would promote revegetation of the right-of-way following construction.

The utility projects listed in table 4.13-1 that are linear in nature have the greatest potential to fragment wildlife habitat. The potential for habitat fragmentation resulting from the proposed E2W Project would be reduced because a majority of the disturbed areas would be allowed to return to pre-existing conditions. Through applicable permitting processes, all of the projects would likely be required to implement mitigation measures designed to minimize the potential for long-term erosion, increase the stability of site conditions, and, in many cases, control the spread of noxious weeds, thereby minimizing the degree and duration of the cumulative impacts of these projects.

Construction of the E2W Project at the same time as other projects listed in table 4.13-1 that would affect waterbodies could cause cumulative impacts on aquatic resources within the Project area. The geographic extent and duration of disturbances caused by construction of the E2W Project would be minimal and further minimized by the implementation of Algonquin's E&SCP, SPCC Plan, and the site-specific crossing plans prepared in consultation with the FERC and other agencies. Additionally, the other projects listed in table 4.13-1 that would involve direct in-stream impacts would be required to obtain permits from the COE, the MassDEP, and the CTDEP, and consult with the EPA, the FWS, and NOAA Fisheries. These agencies would require measures to mitigate impacts on aquatic resources associated with these other projects.

The crossings of the Weymouth Fore River and Shetucket River have the greatest potential to affect aquatic resources because they have been designated by NOAA Fisheries as EFH. However, if the Weymouth Fore River and Shetucket River are successfully crossed using the HDD method, impacts would not be expected to occur. Should a frac-out occur during the HDD crossing of these rivers, any effects would be minimized by the implementation of Algonquin's HDD Contingency Plan. The duration of disturbances caused by construction of the E2W Project would be minimal and further minimized by the implementation of Algonquin's E&SCP, SPCC Plan, and HDD Contingency Plan in addition to any conditions required by the COE, the MassDEP, and the CTDEP as part of their respective permit approvals.

Land Use, Recreation, Special Interest Areas, and Visual Resources

The proposed Project and several other foreseeable future projects would result in both temporary and permanent changes to current land uses. Much of the land that would be disturbed by construction of the E2W Project is open land or commercial/industrial land. Construction of the E2W Project would temporarily disturb about 492.1 acres of land of which 35 percent would be open land, 32 percent would be forest land, 23 percent would be commercial/industrial land, 8 percent would be residential land, 2

percent would be agricultural, and less than 1 percent would be open water. The utility and commercial/residential development projects listed in table 4.13-1 would disturb hundreds of additional acres of land affecting a variety of land uses.

While most of these projects would have permanent impacts on land uses, the majority of land use impacts associated with the E2W Project would be temporary. Permanent impacts on land use would be small because 79 percent of the land affected by construction of the pipeline facilities would be allowed to revert to prior uses following construction with no additional restrictions; although about 101.0 acres of land would be required for the new permanent pipeline easement (80.8 acres), the operation of aboveground facilities (15.1 acres), and the use of the permanent access roads (5.1 acres). This includes 56.6 acres of forest land that would be converted to open and commercial/industrial land.

The proposed Project, if built at the same time as other foreseeable future projects, could result in cumulative impacts on recreational and special interest areas if these projects would affect the same area or feature (e.g., trails) at the same time. The proposed pipeline facilities would cross or be located adjacent to several recreation and special interest areas. However, because the E2W Project would be constructed primarily within or adjacent to existing rights-of-way and would not substantially affect the current land uses, most Project-related impacts would be short term, often lasting only for the duration of construction through that area, after which the area would be restored to its preconstruction condition.

The visual character of the existing landscape is defined by historic and current land uses such as agricultural, recreation, conservation, and development. The visual qualities of the landscape are further influenced by existing linear installations such as highways, railroads, pipelines, and electrical transmission and distribution lines. Within this context, the proposed compressor station and other aboveground facilities would have the most visual impact, while the pipeline portion of the proposed Project would be visually subordinate to the existing landscape character and would contribute only incrementally to overall visual conditions, particularly after completion of reclamation and the re-establishment of vegetation. The utility and commercial/residential projects listed in table 4.13-1 would have the most impact on visual resources in the area. Because the majority of the pipeline facilities would be located within or adjacent to existing rights-of-way, the visual impact would be reduced. In addition, Algonquin's E&SCP would promote revegetation of the right-of-way with native herbaceous and scrub species.

Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the Project area. As described below, employment, housing, and infrastructure, and public services could experience both beneficial and detrimental impacts. There would also be some impacts on transportation and traffic.

Economy and Employment – The projects considered in this section would have cumulative effects on employment during construction if more than one project is built at the same time. Algonquin estimates that the E2W Project would employ up to 840 workers during the peak construction months, of which about 40 to 50 percent would be local hires. If the larger projects are built simultaneously, the demand for workers could exceed the local supply of appropriately skilled labor. The counties affected by the Project have a civilian labor force of about 753,925 people and an average unemployment rate of 5 percent. This suggests that the local labor force could meet much of the employment needs required for construction of these projects, although it is unknown whether a sufficient number of these unemployed persons have the necessary skills to work on these projects. Therefore, if these projects are constructed at the same time, the demand for local workers may exceed supply. It is assumed that the remainder of the employment positions would be filled by non-local hires. Algonquin anticipates hiring three full-time

staff to fill permanent positions associated with operation and maintenance of the facilities. This small increase in full-time positions within the Project area would have a minor positive effect on the economy.

In addition to impacts on local employment, these projects would provide an increase in tax revenue for Connecticut, Massachusetts, the counties, and other local economies through the payment of payroll tax, sales tax, property tax, and other taxes and fees. As discussed in section 4.9.7, the estimated payroll for the proposed E2W Project would be about $137 million during the construction phase and the annual property taxes are anticipated to be $750,000 to $1,250,000. A similar net increase in payroll and tax revenues could be expected from the other projects listed in table 4.13-1. The proposed Project would have both short- and long-term beneficial impacts on state, county, and local economies.

Temporary Housing – Temporary housing for the construction workers would be needed for the portion of the workforce not drawn from the local area. Given the vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms and campgrounds available in the cities and towns in the vicinity of the Project, construction workers should not encounter difficulty in finding temporary housing. If construction occurs concurrently with other projects, temporary housing would still be available but may be slightly more difficult to find and/or more expensive to secure. Regardless, these effects would be temporary, lasting only for the duration of construction, and there would be no long-term cumulative effect on housing from the proposed Project.

Infrastructure and Public Services – The cumulative impact of the E2W Project and the other projects listed in table 4.13-1 on infrastructure and public services would depend on the number of projects under construction at one time. The small incremental demands of several projects occurring at the same time could become difficult for police, fire, and emergency service personnel to address. This problem would be temporary, occur only for the length of construction, and could be mitigated by the various project sponsors providing their own personnel to augment the local capability or by providing additional funds or training for local personnel. No long-term cumulative effect on infrastructure and public services is anticipated from the proposed Project.

Transportation and Traffic – Where installation of the proposed Project occurs at road crossings, road traffic could be temporarily disrupted or delayed. Construction activities could disrupt traffic flow, and result in cumulative impacts on traffic in the Project area if several projects are constructed at once. Major roads and highways would be bored and construction would not affect traffic. The addition of traffic associated with construction personnel commuting to and from the project sites could affect traffic congestion in the region if several of the projects listed in table 4.13-1 would occur within the same timeframe. However, workers associated with the E2W Project would commute to and from the pipeline right-of-way, pipe storage and contractor ware yards, or aboveground facility sites during off-peak traffic hours (e.g., before 7:00 AM and after 6:00 PM). Moreover, it is unlikely that each project would reach peak traffic conditions simultaneously; therefore, potential cumulative impacts on traffic from construction, should they occur, are expected to be temporary and short term. The relatively small number of permanent workers required for operation and maintenance of the proposed facilities should result in negligible long-term impacts on the transportation infrastructure.

Cultural Resources

Past disturbances to cultural resources sites in the Project area are typically related to accidental disturbances; intentional destruction or vandalism; lack of awareness of historical value; and construction and maintenance operations associated with existing roads, railroads, utility lines, and electrical transmission lines. The currently proposed projects listed in table 4.13-1 that are defined as federal actions would include mitigation measures designed to avoid or minimize additional direct impacts on cultural resources. Where direct impacts on significant cultural resources are unavoidable, mitigation

(e.g., recovery and curation of materials) would occur before construction. Non-federal actions would need to comply with any mitigation measures required by the affected states. Increased access by rights-of-way and service roads would increase the potential for trespass or vandalism at previously inaccessible sites. Therefore, the proposed Project may incrementally add to the effects of the other projects. However, this incremental increase would not be significant.

Air Quality and Noise

The E2W Project and the projects listed in table 4.13-1 would all involve the use of heavy equipment that would generate emissions of air contaminants, fugitive dust, and noise. The majority of these impacts would be minimized because the construction activities would occur over a large geographical area.

Any air impacts would be localized and confined primarily to the airsheds in which the projects occur. Cumulative impacts on air quality, therefore, would be limited primarily to areas where more than one project is proposed within the same airshed and would be constructed simultaneously. Several projects, including both utility and commercial/industrial development projects, are planned in the vicinity of the E2W Project and may be constructed within the same timeframe. These effects could temporarily add to the ongoing effects from any commercial activities and traffic in the Project area. Mitigation measures similar to those outlined in section 4.9.4 for the proposed Project would likely be required for these other projects. Because the projects listed in table 4.13-1 would take place over a large area; have varying construction schedules; and adhere to federal, state, and local regulations for the protection of ambient air quality, long-term cumulative impacts on air quality would not be anticipated.

Because the impact of noise is highly localized and attenuates quickly as the distance from the noise source increases, cumulative impacts associated with construction or operation would be unlikely unless one or more of the projects listed in table 4.13-1 is constructed at the same time in the same location. However, even short-term additional noise during construction could, for example, create enough disturbance to nesting birds to constitute a potential adverse impact. Although the Project could result in cumulative noise impacts if other projects listed in table 4.13-1 would be constructed within the same timeframe and vicinity, the majority of these impacts would be limited to the period of construction.

Reliability and Safety

Impact on reliability and public safety would be mitigated through the use of the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192, which are intended to protect the public and to prevent natural gas facility accidents and failures. In addition, Algonquin's construction contractors would be required to comply with the OSHA Safety and Health Regulations for Construction in Title 29 CFR Part 1926. No cumulative impacts on safety and reliability would be anticipated to occur.

Conclusion

The majority of cumulative impacts would be temporary and minor. However, long-term cumulative impacts would occur on vegetation and wildlife habitat. Long-term cumulative benefits to the community would be realized from the increased tax revenues. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials.

4.14 GROWTH-INDUCING IMPACTS

A project would be considered to have a growth-inducing impact if it fostered economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment because increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects.

As discussed in section 4.9, the E2W Project would provide temporary employment for up to 840 workers during the peak construction months. However, about 40 to 50 percent of these workers would be local hires and the duration of the construction period is anticipated to be only about 6 months. Although the proposed Project is expected to have a short-term positive effect on the area rental industry through increased demand and higher rates of occupancy, no significant impacts on the local housing markets are expected. Three permanent employees would be required for operation and maintenance of the proposed Project, and Algonquin plans on relocating 10 employees currently working at its Dighton office to the Rehoboth Compressor Station for a total of 13 permanent employees. This total number of permanent employees would have little or no impact on the population in the region and would have a negligible effect on existing public infrastructure and community services.

As discussed in section 1.1, the E2W Project was developed in response to significant interest from shippers that require transportation capacity to accommodate increased receipts of natural gas at the east end of the Algonquin system for redelivery to high growth markets in the Northeast. The Project area is already served by various fuel supplies and increased demand for natural gas is already taking place. When completed, the Algonquin system would provide customers with diversified access to regional supplies that would accommodate projected growth in demand. We believe the demand for energy and the proposed Project are a result of, rather than a precursor to, development in this region. Although we recognize that the availability of additional natural gas may be a contributing factor in stimulating economic and population growth and could result in the construction of additional power infrastructure, any determination as to the location and magnitude of such growth is premature and speculative at this time.