# New England Clean Power Link Project

**Excerpt from US Army Corps of Engineers Application for Department of the Army Permit (Section 404/10):**

**Narrative on Project Description and Purpose, Section 7.0 Alternatives Analysis**

**November 2014**

# 7.0 ALTERNATIVES ANALYSIS

## 7.1 Introduction

Pursuant to the Environmental Protection Agency's (EPA) "*Guidelines for Specification of Disposal Sites for Dredged or Fill Material*" (Guidelines)[2] implementing Section 404(b)(1) of the Clean Water Act, applicants for a Section 404 permit must demonstrate there is no practicable alternative to a proposed discharge "which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."[3] An alternative is "practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes."[4]

The USACE is the final arbiter of 404(b)(1) determinations regarding the least environmentally damaging practicable alternative. To assist in the USACE's analysis, TDI-NE has evaluated a number of alternatives and assessed a number of factors, and selected a preferred alternative based on the requirements of Section 404 (b)(1) of the CWA.

## 7.2 Initial Reliability and Engineering Considerations

TDI-NE conducted feasibility studies to determine where the Project could safely interconnect in Vermont to the ISO-NE transmission system without jeopardizing grid reliability. To evaluate potential points of interconnection, TDI-NE retained Siemens PTI to study the following three existing backbone 345kV substations in Vermont, all of which are owned and operated by VELCO: the New Haven 345 kV Substation located in Addison County, Vermont (New Haven Substation); the West Rutland 345 kV Substation located in Rutland County, Vermont (West

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[2] 40 C.F.R. § 230 et seq.
[3] 40 C.F.R. § 230.10(a).
[4] *Id.* at § 230.10(a)(2).

Rutland Substation); and the Coolidge 345 kV Substation in Windsor County, Vermont (Coolidge Substation).

To assess the suitability of interconnecting 1,000 MW of new generation at each of these interconnection points, TDI-NE analyzed each substation to determine:

- whether the substation has sufficient interconnection points (or whether the substation had the capability to add sufficient interconnection points);
- whether the ISO-NE transmission system could accommodate the additional generation supply at these locations without requiring significant transmission system upgrades;
- whether a DC-to-AC converter station could be sited in close proximity to the substation; and
- whether the AC transmission cables from the converter station could access the substation without encountering significant constraints.

After concluding its technical analyses, TDI-NE determined that the New Haven Substation and West Rutland Substation presented significant issues because both of these substations interconnect to only *one* existing 345-kV transmission line. Without significant upgrades to the ISO-NE transmission system, it would not be possible to reliably deliver 1,000 MW of new capacity to these substations. In contrast, the Coolidge Substation is interconnected to *two* existing 345-kV transmission lines, thereby providing the infrastructure necessary to reliably interconnect the Project. Further, TDI-NE was able to secure site control at three parcels for the converter station that are located in close proximity to the Coolidge Substation. Siting a converter station on these parcels is consistent with existing land uses and will minimize environmental impacts and disruptions to the community as the AC cables from the converter station are expected to be installed for only 0.3 miles in an unpaved town road.

### 7.3 Criteria for Assessing Alternatives

After making a determination that the Project could reliably interconnect to the ISO-NE system at the Coolidge Substation, TDI-NE evaluated a number of route alternatives from the Canadian border to the substation. Each alternative was evaluated in relation to the project's purpose and need, and only those alternatives that met the project's overall purpose were considered further.[5] For alternatives that met the Project purpose, factors including cost, logistics, and technology were considered to identify which alternatives were "practicable" based on TDI-NE's interpretation of the Guidelines and applicable precedent. In determining practicability, consideration was given to engineering constraints (e.g., steep slopes, narrow ROWs, existing structures), impacts to communities and associated anticipated public opposition, worker safety, reliability considerations, consistency with existing or future land use, and the scope of any land rights that would need to be acquired for a given alternative.[6] Additionally, only HVDC cable technology is considered because HVDC (as compared to HVAC) has the ability to transmit large amounts of power over long distances with lower energy losses.

With regard to the determination of whether an alternative is practicable based on its cost, the EPA has determined that an alternative is not practicable when it is unreasonably expensive to the applicant.[7] According to the USACE and EPA, "[t]he determination of what constitutes an unreasonable expense should generally consider whether the projected cost is substantially greater than the costs normally associated with the particular type of project."[8] Unlike traditional

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[5] For example, alternatives outside of the State of Vermont were not considered because the Project's stated purpose is to deliver renewable power into the State of Vermont. TDI-NE's decision to interconnect into Vermont was based on a number of factors, including the reliability benefits that would accrue to ISO-NE as a result of having this generation supply available to the western side of the regional transmission system and the anticipated closing of Entergy's Vermont Yankee generation facility.

[6] With regard to reliability considerations, some alternatives may adversely impact the performance and/or operation of the transmission line and, therefore, would be inconsistent with the Project purpose.

[7] Preamble to Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 45 Fed. Reg. 85,336, 85,343 (Dec. 24, 1980) as referenced in U.S. Envtl. Prot. Agency & U.S. Army Corps of Engineers, *Memorandum: Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternatives Requirements* § 3.b. (Aug. 23, 1993) ("Section 404(b)(1) Compliance Memorandum"), http://water.epa.gov/lawsregs/guidance/wetlands/flexible.cfm

[8] *See* U.S. Envtl. Prot. Agency & U.S. Army Corps of Engineers, *Memorandum: Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternatives Requirements* § 3.b. (Aug. 23, 1993) http://water.epa.gov/lawsregs/guidance/wetlands/flexible.cfm.

utilities -- which recover their cost-of-service from captive wholesale customers -- the NECPL is a merchant transmission line and TDI-NE assumes the full risk of market development.[9] The Project, therefore, must be competitively-priced in order to attract potential transmission customers. As is true for other similarly-situated merchant developers, the cost of developing and constructing a transmission line could increase to such an extent that the transmission service no longer becomes attractive for power suppliers seeking to arbitrage power markets. Thus, consistent with previous EPA and USACE guidance, the cost of various alternatives takes into account the "merchant" nature of the Project.[10]

For alternatives found to be practicable, TDI-NE analyzed each route using publically-available GIS datasets to determine the scope of potential resource impacts. Even for those alternatives that were identified as not practicable, TDI-NE conducted a GIS-based resource impact assessment. The criterion used in the resource assessment for both practicable and non-practicable alternatives were selected based on consultation with the USACE, and their likely applicability to the Project's proposed construction and operation impacts, as well as availability of associated datasets. Publically-available GIS data was utilized for the assessment to ensure that results are replicable. See Table 7-1.

**TABLE 7-1**
**ASSESSMENT OF ROUTING ALTERNATIVES:**
**ENVIRONMENTAL IMPACT ANALYSIS CRITERIA**

| **Criteria** | |
|---|---|
| AQUATIC ECOSYSTEMS | |
| NWI and VSWI | • Acres of wetlands within 100' of alternative |

[9] See Allocation of Capacity on New Merchant Transmission Projects and New Cost-Based, Participant-Funded Transmission Projects; Property Rights to New Participant Funded Transmission, 142 FERC ¶ 61,038 at P 1 (2013) at http://www.ferc.gov/whats-new/comm-meet/2013/011713/E-2.pdf.
[10] See U.S. Env. Protection Agency and United States Department of the Army, *Regulatory Guidance Letter 93-02, Subject: Guidance on Flexibility of the 404(b)(1) Guidelines and Mitigation Banking* (August 23, 1993).

| | |
|---|---|
| Wetlands | • Acres of wetlands within 50’ of alternative |
| Stream Crossings | • Number of stream crossings |
| NON-AQUATIC ECOSYSTEMS | |
| Rare, Threatened, and Endangered Species | • # of RTE species within 100’ of alternative<br>• # of RTE species within 50’ of alternative<br>• Acres of RTE habitat within 100’ of alternative<br>• Acres of RTE habitat within 50’ of alternative |
| Significant Natural Communities | • Acres of Significant Natural Communities within 50’ of route segment<br>• Acres of Significant Natural Communities within 100’ of route segment |
| Uncommon Species | • # of Uncommon species within 100’ of alternative<br>• # of Uncommon species within 50’ of alternative<br>• Acres of Uncommon species habitat within 100’ of alternative<br>• Acres of Uncommon species habitat within 50’ of alternative |
| Wildlife Habitat | • Acres of deer wintering areas within 100’ of alternative<br>• Acres of deer wintering areas within 50’ of alternative |
| Anthropogenic Resources / Constraints | • # of Public Water sources within 500’ of alternative<br>• # of hazardous waste sites within 500’ of alternative |

Each of these criterion is further described below.

### 7.3.1 Wetlands

For the desktop comparison, the TDI-NE analyzed both the National Wetlands Inventory (NWI) and the Vermont Significant Wetland Inventory (VSWI). These two datasets are described below. The NWI was developed by the U.S. Fish and Wildlife Service (USFWS) and provides mapping of wetlands and deepwater habitats (e.g., streams, lakes, estuaries, etc.) on a USGS quad map base generally at a scale of 1:24,000. Only those wetlands and other waters that are visible on high altitude aerial photographs are mapped, and most maps date to the mid-1980s. The VSWI was developed by the Vermont Agency of Natural Resources (VANR) and provides the approximate location and configuration of wetlands. It is viewed as a slightly refined dataset in comparison to NWI for the State of Vermont. Both of these datasets provide an efficient means of comparing multiple alternatives. The analysis calculated acres of wetlands within 50 feet and 100 feet of the route alternatives.

### 7.3.2 Stream Crossings

River and stream crossings would be accomplished via crossing over or under existing culverts where feasible, trenching, or HDD / Jack and Bore.[11] The specific design of each crossing would need to consider site-specific conditions, and the Applicant would establish and implement a program whereby restoration would occur upon completion of the construction and stabilization activities. While clearing of existing vegetation in or near waterbodies would be limited to the area necessary to allow for completion of construction activities and to allow for reasonable access for long-term maintenance, it would nonetheless represent an impact. This desktop

[11] In two instances, the cables will be attached to existing structures such as bridges.

analysis calculated the number of stream crossings for each of the route alternatives based on mapping developed by the U.S. Geological Survey.

#### 7.3.3 RTE Species and Significant Natural Communities

The VFWD's Natural Heritage Inventory maintains a database of known rare, threatened and endangered species and natural (plant) communities in Vermont. In order to understand the potential impacts of the alternatives on sensitive species and communities, the Applicant's desktop analysis evaluated not only the number of potential RTE species within proximity to an alternative (i.e. 50 feet and 100 feet), but also the approximate total acreage of the state-identified areas of potential occupancy for these species. The intent was to distinguish between, for example, an alternative that connected with the outer limits of the potential occupancy area of four species and an alternative which would bisect the occupancy range of one species. For significant natural communities, the Applicant evaluated the total acreage of these defined areas within proximity to an alternative.

#### 7.3.4 Uncommon Species

The VFWD maintains a database of known uncommon, rare, threatened and endangered animal and plant species and natural (plant) communities in Vermont. The data is described by VFWD as being "largely composed of uncommon species data (S3 Rank), but may also include poorly documented rare species (S1 or S2 Rank) or potentially significant natural communities." As with the RTE species, the Applicant's desktop analysis evaluated both the number of uncommon species within proximity to an alternative, as well as the total acreage of the state-identified areas of potential occupancy for these species.

#### 7.3.5 Wildlife Habitat

Deer wintering areas are utilized by white-tailed deer (*Odocoileus virginianus*) in Vermont. Being near the northern extreme of the white-tailed deer's range, functional winter habitats are considered essential to maintain stable populations of deer. Deer wintering areas are generally characterized by rather dense softwood (conifer) cover, such as hemlock, balsam fir, red spruce, or white pine. Occasionally deer wintering areas are found in mixed forest with a strong softwood component or even on west facing hardwood slopes in conjunction with softwood cover. The original deer wintering area mapping in Vermont was undertaken in the 1970s and early 1980s and was based on field visits and interviews with wildlife biologists and game wardens. In 2008, the boundaries of deer winter areas were refined by the VFWD using black and white leaf-off 1:5,000 scale orthophotography (1990-1999 and 1:24,000 scale 2003 NAIP [color, leaf-on]) imagery. VFWD District Biologists reviewed the areas from 2009 to 2010 for their concurrence from their knowledge of the sites. The 2008 mapping project did not involve any fieldwork, but was based on aerial photography. The desktop analysis for potential routes calculated acres of mapped deer wintering areas within 50 feet and 100 feet of the Project route and the alternatives.

### 7.3.6 Public Water Source Protection Areas

To enhance regulatory protection in areas where groundwater resources are most productive and most vulnerable, Vermont has established Source Protection Areas (SPAs) for public drinking water sources. Zone 1 SPAs are defined as a 200-foot radius around a source, and Zones 2 and 3 for geologically delineated recharge areas. SPA boundaries have been located on USGS topographic maps by the Vermont Department of Environmental Conservation's Water Supply Division and historically by the Vermont Department of Health. The analysis calculated the number of public water sources within 500 feet of the route alternatives.

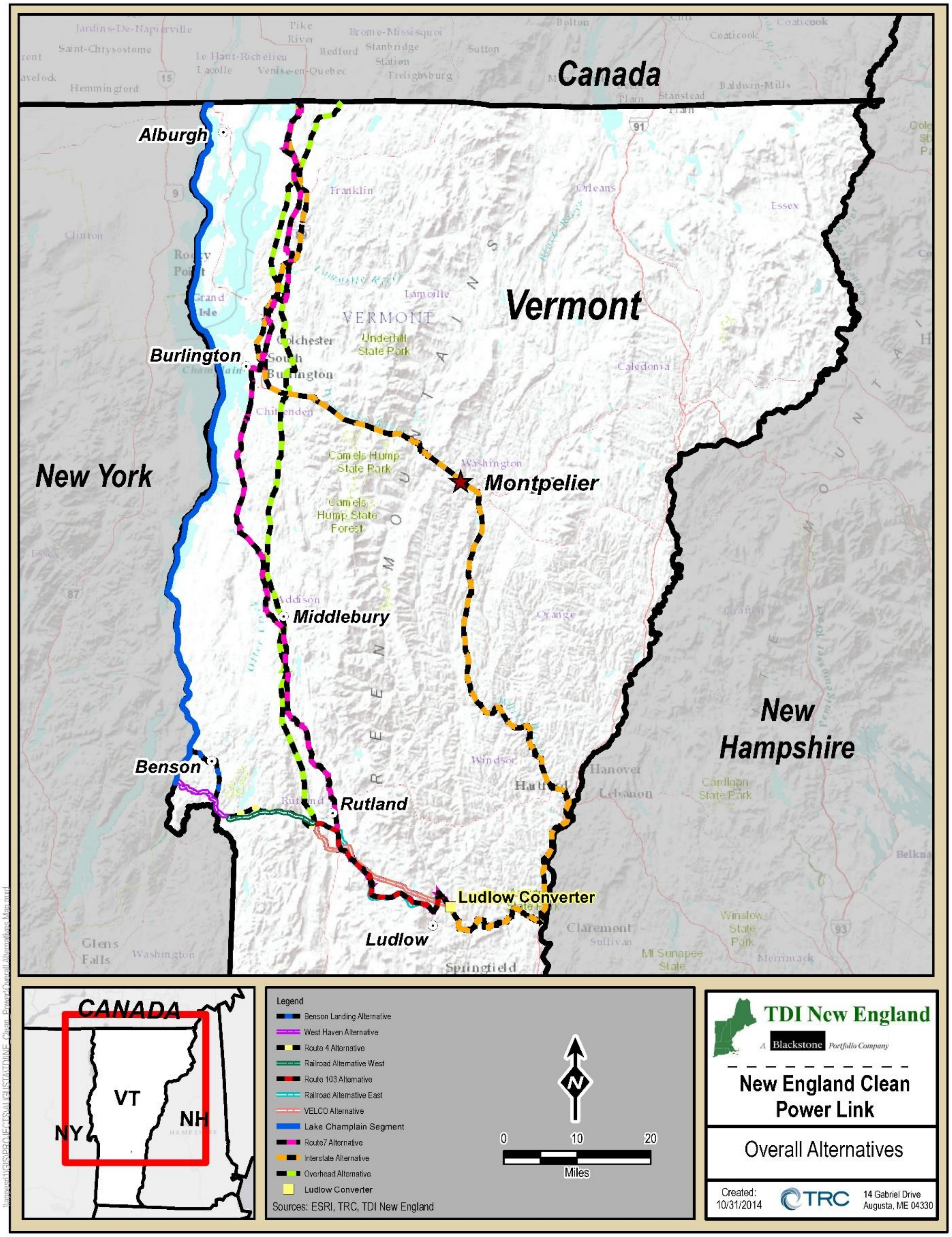
### 7.3.7 Hazardous Waste Sites

The VDEC maintains a point coverage database of known hazardous wastes sites or locations in Vermont where hazardous materials have been released. Sites are located by comparing features on a paper map to features onscreen and estimating the correct location of the site relative to other features. VDEC staff knowledge of the location of each site is used to locate it on orthophotos. The analysis calculated the number of hazardous waste sites within 500 feet of the Project and route alternatives.

### 7.4 Overview of Alternatives Considered

The Applicant developed alternatives based on a review of existing ROWs (roadway, railroad, and utility), as well as consultation with state and federal agencies as to routes to consider in this analysis. Three entirely overland routes were identified which followed existing road and/or utility ROWs. In considering alternatives which included an in-water segment, the Applicant identified three distinct segments, each of which in turn contained specific alternatives. For ease of review, these alternatives are presented as follows: (1) a Lake Champlain Segment (two alternatives); (2) a Western Segment (two alternatives); and (3) an Eastern Segment (three alternatives). The intent of this division is to identify the alternative within each segment that has the least environmental impacts, so as to arrive at a final alternative which would represent the least environmentally damaging routing. Figure 7-1 depicts all of the alternatives, which generally contain overland segments that are entirely within existing or proposed ROWs.

**FIGURE 7-1**
**ROUTING ALTERNATIVES FOR NECPL**



**Overland Alternatives**

- Route 7 Alternative: Overland buried from US/Canadian Border along Route 7 ROW to the converter station
- Interstate Alternative: Overland buried from US/Canadian Border along Interstates 89 and 91 ROWs to the converter station
- Overhead Alternative: Overland overhead from US/Canadian Border adjacent to existing utility ROWs to the converter station

**Lake Segment Alternatives**

- West Haven Alternative: Lake Segment Alternative – Lake Champlain to West Haven to Fair Haven to connect to Western Segment Alternatives
- Benson Landing Alternative: Lake Segment Alternative – Lake Champlain to Benson Landing to Fair Haven to connect to Western Segment Alternatives

**Western Segment Alternatives**

- Route 4 Alternative: Western Segment Alternative – Roadway ROW to Eastern Segment Alternatives
- Railroad Alternative West: Western Segment Alternative – Railroad ROW to Eastern Segment Alternatives

**Eastern Segment Alternatives**

- Route 103 Alternative: Eastern Segment Alternative – Roadway /Railroad ROW to the converter station
- Railroad Alternative East: Eastern Segment Alternative – Railroad/Roadway ROW to the converter station
- VELCO Alternative: Eastern Segment Alternative – VELCO ROW to the converter station

### 7.5 Alternatives Determined Not To Be Practicable

Applying the criterion from the Guidelines of cost, existing technology, and logistics in light of overall project purposes, the Applicant believes that the Route 7, Interstate, and Overhead Alternatives are not practicable.

#### 7.5.1 Route 7 and Interstate Alternative[12]

The Route 7 Alternative would cross the U.S.-Canada border in Highgate, Vermont using an existing local road to connect to Route 7. The routing would follow Route 7 south for approximately 125.2 miles before entering the VELCO ROW in Clarendon to the north of the interconnection of Route 7 with Route 103. This alternative would then travel 17.8 miles to the east / southeast in the VELCO ROW to the proposed converter station location. The Interstate Alternative would cross the U.S.-Canada border in Highgate, Vermont and travel south within the Interstate 89 ROW for a distance of approximately 127.87 miles before connecting to Interstate 91 in White River Junction, Vermont. The route would travel in the Interstate 91 ROW for a distance of approximately 18.47 miles to Ascutney, Vermont. From Ascutney, the cables would travel for approximately 15 miles west to Proctorsville, Vermont along Route 131, then travel along town roads for approximately 4 miles north / northeast to the proposed converter station location Both alternatives are depicted in Figure 7-2.

[12] Route 7 and Interstate Alternatives are addressed together given the significant overlap in the analysis of these two alternatives.

**FIGURE 7-2**
**ROUTE 7 AND INTERSTATE ALTERNATIVES**

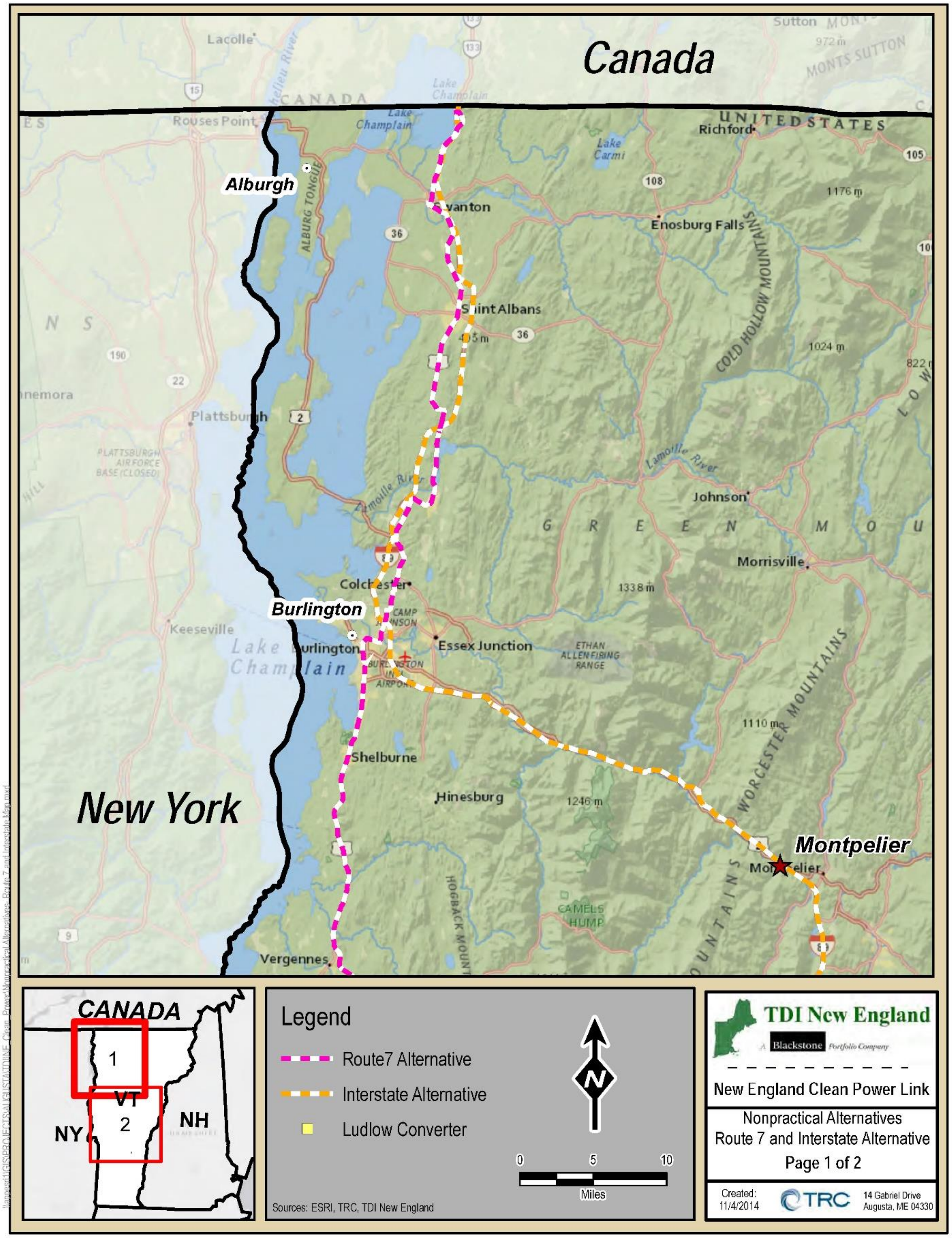
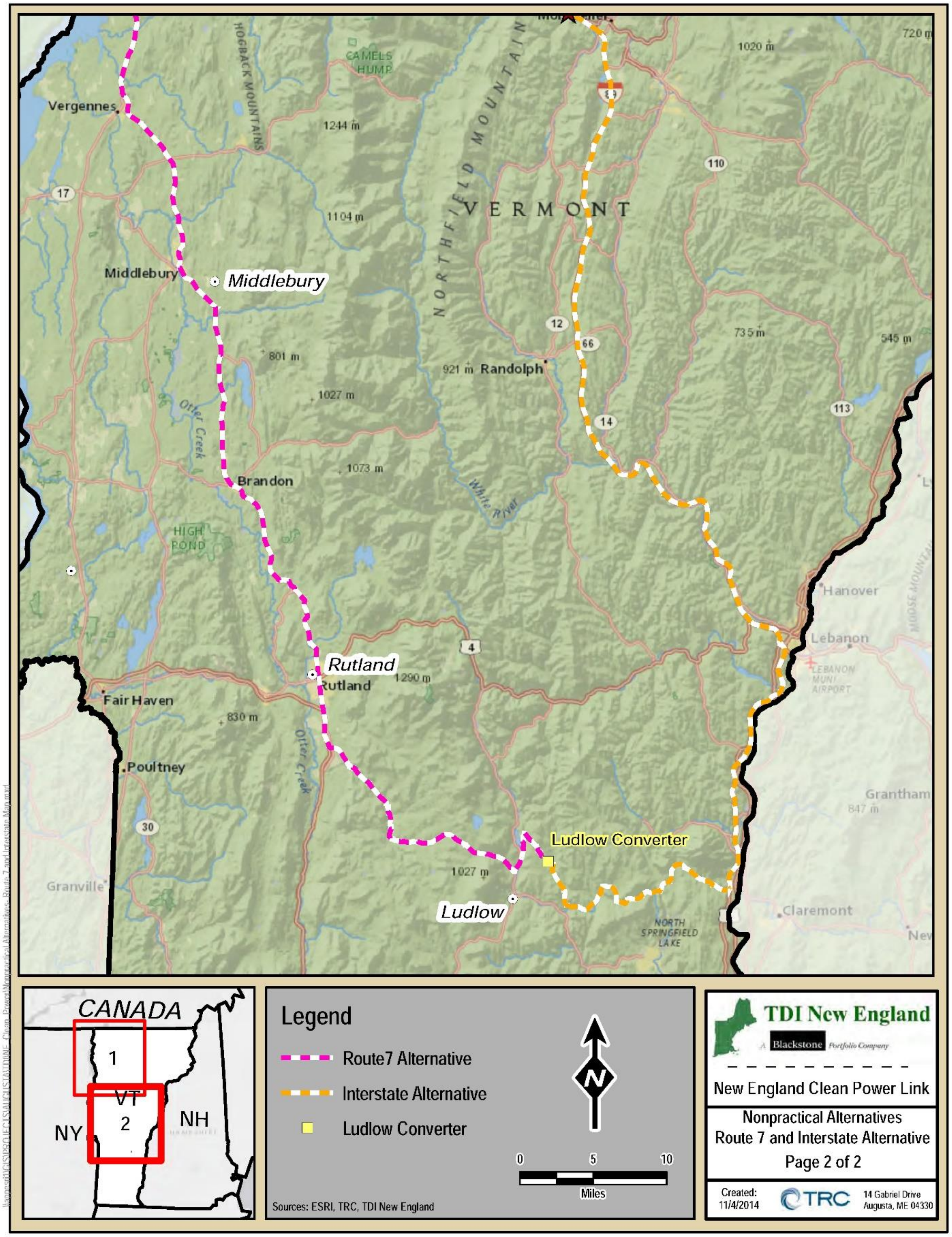


**FIGURE 7-2 (CONTINUED)**
**ROUTE 7 AND INTERSTATE ALTERNATIVES**



There are significant obstacles to developing and permitting the Route 7 alternative because of its potential adverse impacts to local communities. Specifically, the Route 7 Alternative would traverse some of Vermont's largest densely populated municipal areas (e.g., Burlington, South Burlington, Middlebury, and Rutland), as well as numerous smaller communities. Where the alternative would pass through the centers of these communities, the roadway is bordered on each side by dense residential and commercial buildings, so that construction associated with installation would be disruptive and would likely encounter public opposition. The construction corridor is particularly complicated in the largest cities due to the density of buildings adjacent to the roadway and the existing network of overhead and buried utilities. Additionally, Route 7 is a very busy travel corridor and the Route 7 Alternative would traverse several developed areas where existing infrastructure, as well as the density of business and residential development, would inhibit construction activities.

While the Interstate Alternative largely avoids community impacts, it also poses permitting and engineering challenges. This alternative route would encounter 19 entrance/exit ramps associated with Interstates 89 and 91. Each of these intersections would likely require an HDD and thereby increase the Project's cost. Interstates 89 and 91 also cross multiple local and state roadways via bridges, so installation in these areas would require repeated utilization of expensive HDDs or similar approaches to facility crossings of these features. A review of the National Bridge Inventory[13] indicates that this alterative would cross several bridges with a total length of greater than 500 feet, some of which traverse steep river valleys. For example, along I-89 in Sharon, VT there are two bridges that span the White River. They are both over 800 feet long and are approximately 70 feet above the River. These long HDDS and deep valleys present significant engineering challenges and the Vermont Agency of Transportation (VTrans) has indicated that attaching the cables to State bridges is not acceptable.

[13] http://www.uglybridges.com/scripts/search.cgi

Both alternatives also are significantly more costly than the proposed route. See Table 7-2. The Route 7 Alternative results in an added cost of approximately $120 million, or 19% higher than the comparable costs for the proposed alternative. The Interstate 89 Alternative results in an increase of approximately $237 million, or 37% higher than the comparable costs for the proposed route.[14] Given the significant cost increases associated with these alternatives, the Applicant believes these alternatives are unreasonably expensive and, therefore, not practicable.

**TABLE 7-2**
**COSTS OF PROPOSED PROJECT AND ROUTE 7 / INTERSTATE ALTERNATIVES[15]**

| | Project | Route 7 Alternative | Interstate Alternative |
|---|---|---|---|
| In-water Distance (miles) | 97.6 | 0 | 0 |
| Overland Distance (miles) | 56.2 | 143.0 | 164.8 |
| Total Distance (miles) | 153.8 | 143.0 | 164.8 |
| Total Cost ($millions) | $636.1 | $756.5 | $873.3 |
| Cost Variance from Overall Project ($millions) | | $120.4 | $237.2 |
| Cost Variance from Overall Project (%) | | 19% | 37% |

While TDI-NE does not believe either alternative is practicable, the Applicant nonetheless assessed the potential environmental impacts associated with both of these routes. The environmental analysis further demonstrates that these alternatives would be difficult to permit. As shown in Table 7-3, the acres of wetlands in close proximity to the proposed Project is less than that of either of the two alternatives. The number of stream crossings for the proposed

14 Both of these approximations are conservative and likely underestimate the cost increases associated with these alternatives given the expected number of HDDs and for Route 7 the complexities associated with construction in densely populated ROWs.
15 Installation costs based on following per-mile assumptions (millions of dollars): In-water: $3.44M; roadway ROW: $5.30M; railroad ROW: $5.68M; utility ROW: $5.23M

Project is 70, while the Route 7 Alternative and Interstate Alternative would have 171 and 233, respectively. For the remaining environmental criteria, the Route 7 Alternative and Interstate Alternatives are generally comparable or would result in greater impacts than the proposed Project, indicating that significant environmental impacts are likely to result from construction. Consequently, based on the expected costs of these alternatives, the community and logistical issues in siting these two routes, and the potential adverse environmental impacts, these alternatives were not pursued by the Applicant.

**TABLE 7-3**
**ENVIRONMENTAL RESOURCES ASSOCIATED WITH OVERLAND ALTERNATIVES**

| CRITERIA | ROUTE 7 ALTERNATIVE | INTERSTATE ALTERNATIVE | PROPOSED PROJECT |
|---|---|---|---|
| **AQUATIC ECOSYSTEMS** | | | |
| Acres of Wetlands within 50’ of route segment (VSWI) | 24.4 | 22.0 | 12 |
| Acres of Wetlands within 100’ of route segment (VSWI) | 70.3 | 50.7 | 37.2 |
| Acres of Wetlands within 50’ of route segment (NWI) | 22.2 | 36.4 | 6.3 |
| Acres of Wetlands within 100’ of route segment (NWI) | 56.6 | 77.3 | 19 |
| # of Stream Crossings | 171 | 233 | 70 |
| **NON-AQUATIC ECOSYSTEMS** | | | |
| # of RTE species within 50’ of route segment | 28 | 32 | 14 |
| # of RTE species within 100’ of route segment | 52 | 40 | 14 |
| Acres of RTE species within 50’ of route segment | 15.7 | 40.4 | 44.5 |
| Acres of RTE species within 100’ of route segment | 33.2 | 83.1 | 71.9 |
| Acres of Significant Natural Communities within 50’ of route segment | 0.6 | 3.6 | 0.6 |
| Acres of Significant Natural Communities within 100’ of route segment | 5.5 | 7.9 | 5.23 |
| # of Uncommon species within 50’ of route segment | 45 | 16 | 8 |
| # of Uncommon species within 100’ of route segment | 55 | 20 | 9 |
| Acres of Uncommon species within 50’ of route segment | 43.9 | 11.54 | 14.05 |
| Acres of Uncommon species within 100’ of route segment | 88.0 | 23.4 | 28.8 |
| Acres of Deer Wintering Areas within 50’ of route segment | 12.7 | 34.9 | 17.3 |
| Acres of Deer Wintering Areas within 100’ of route segment | 31.8 | 100.9 | 44.2 |

| CRITERIA | ROUTE 7 ALTERNATIVE | INTERSTATE ALTERNATIVE | PROPOSED PROJECT |
|---|---|---|---|
| # of Public Water Source Protection Areas - Groundwater within 500' of route segment | 26 | 23 | 18 |
| # of Public Water Source Protection Areas – Surface Water within 500' of route segment | 6 | 7 | 0 |
| # of Hazardous Waste Sites within 500' of route segment | 325 | 32 | 15 |

### 7.5.2 Overhead Alternative

The Overhead Alternative would cross the US / Canadian border in Highgate, Vermont and follow existing utility ROWs for a distance of approximately 131 miles to the proposed converter station location. For the purpose of assessing an overhead alternative, the Applicant assumed that the associated route would require the establishment of a new ROW or an expansion of an existing ROW in order to accommodate the infrastructure required for a 1000 MW HVDC transmission project. The overhead route would follow existing overhead electric transmission corridors that were identified with public documents and aerial photography. The route would travel along the western part of the state, to the east of Lake Champlain, traversing several larger communities including Winooski, South Burlington, Shelburne, New Haven, Middlebury, Brandon, and Rutland. The Overhead Alternative is depicted in Figure 7-3.

**FIGURE 7-3**
**OVERHEAD ALTERATIVE**

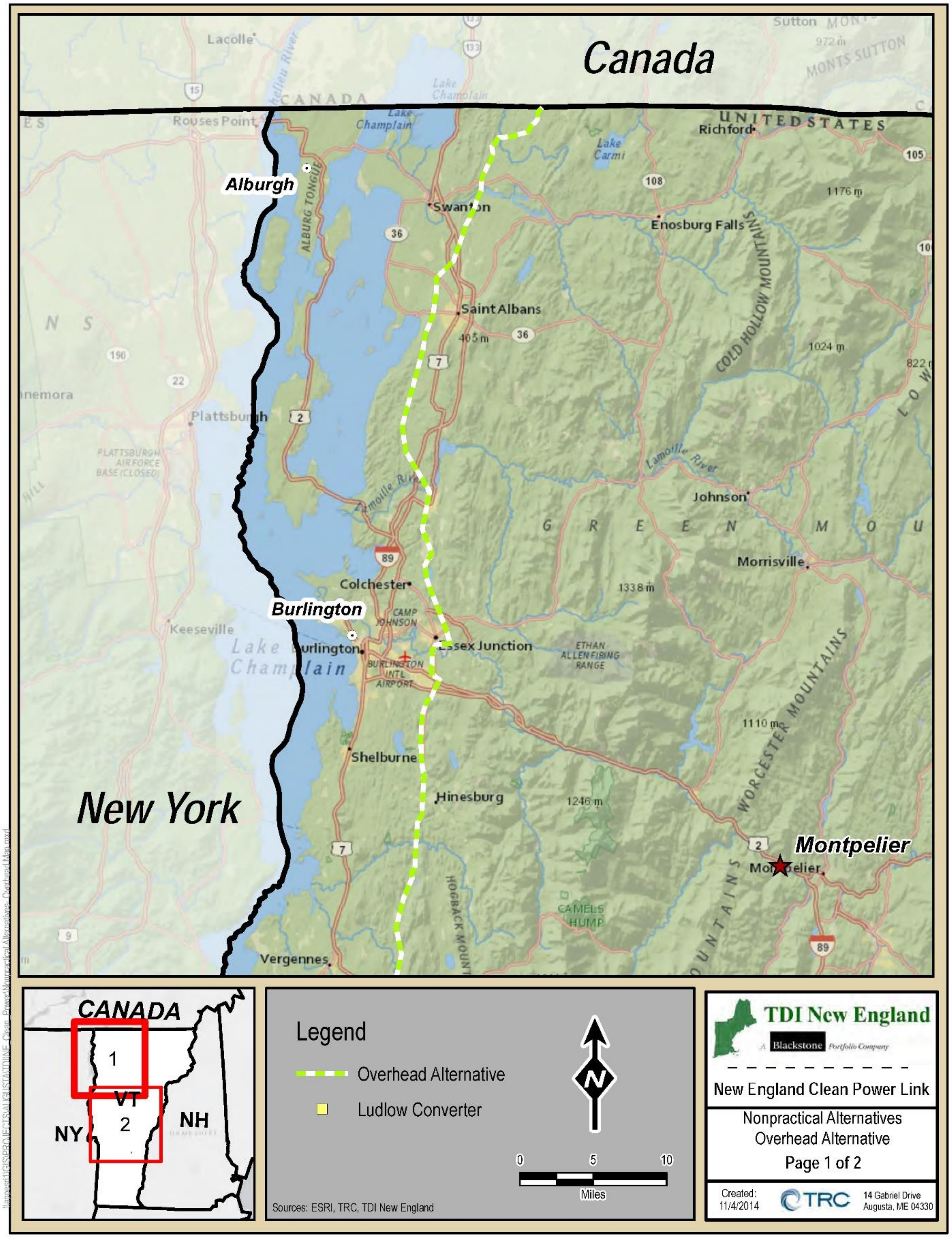
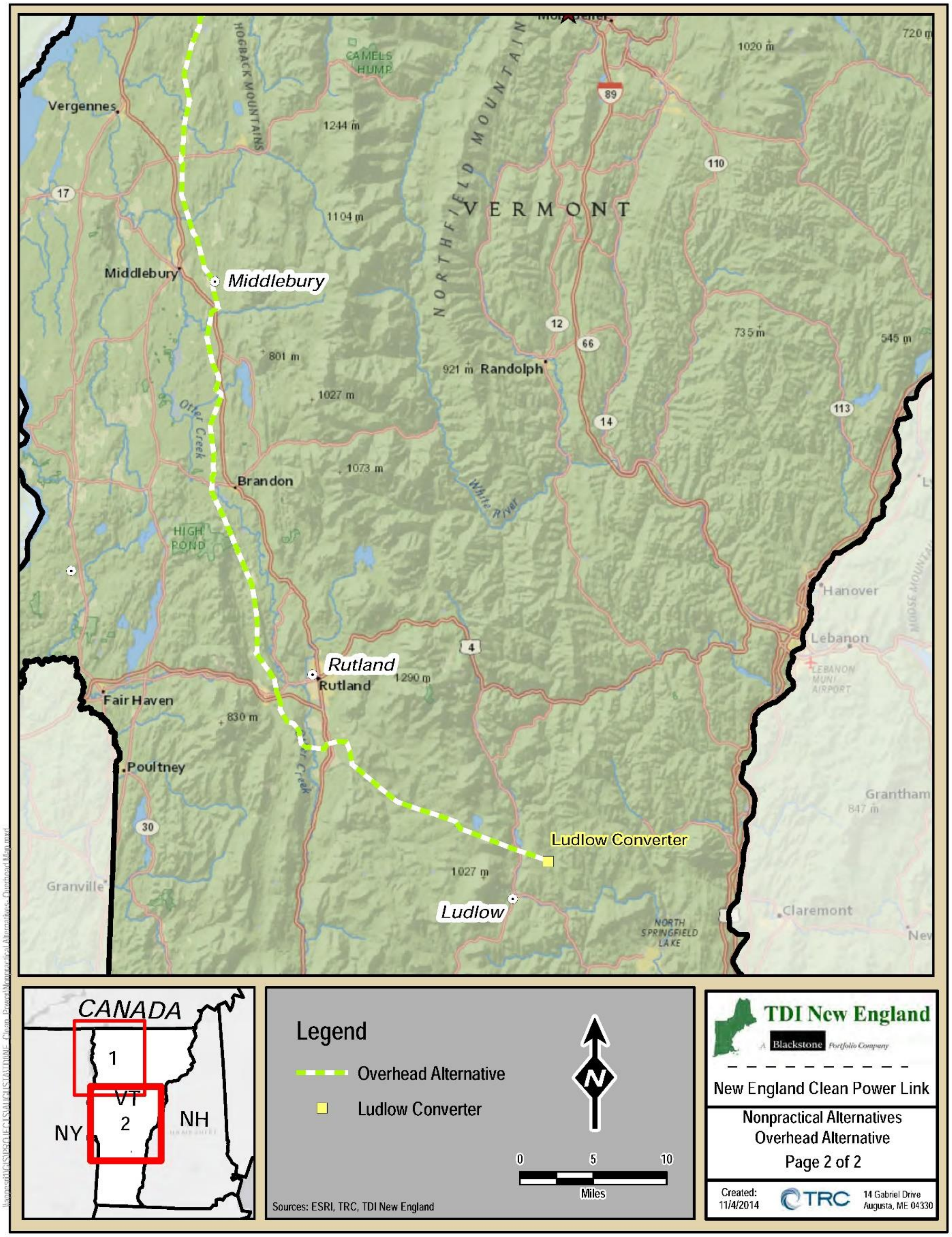


**FIGURE 7-3 (CONTINUED)
OVERHEAD ALTERATIVE**



The overhead HVDC transmission system would likely utilize a bipolar configuration, consisting of two conductors per pole and a ground wire. In general, conductors would have a spacing of approximately 18 inches apart, and each conductor would have an overall diameter of approximately 1.75 inches. A metallic return conductor with a fiber optic core would be installed in the shield wire position above the electrical pole conductors to provide protection against lightning strikes. The return conductor would also provide a communication path between converter stations. A separate shield wire may be necessary on towers with a horizontal arrangement.

Several different transmission tower configurations may be utilized for overhead transmission lines. In general, the potential transmission tower types can be defined as "lattice" or "monopole" designs. Lattice towers are constructed of galvanized steel and are assembled on site. These freestanding towers are widely used as transmission line support structures across the United States.

In contrast to the lattice design, monopole towers have a single-shaft, tubular structure. Because of their smaller footprint, monopole towers are well-suited to right-of-way locations where space is limited and aesthetics are important. Notwithstanding these benefits, monopole towers tend to be more expensive;[16] one transmission study estimated that the total costs for monopole towers were 25% higher than for lattice towers.[17] The specific height and design of each monopole or lattice tower would be determined by the angle of the conductor bundles, the span between towers, and the topography. In general, the lattice or monopole steel support structures for +/-320-kV would be expected to vary from approximately 65 to 135 feet in height, although some

[16] Fabrimet, *Advantages of Lattice Towers*, http://www.fabrimet.com/advantages-lattice-towers.html (last visited Apr. 22, 2013).
[17] Joseph J. Seneca, Michael L. Lahr, James W. Hughes & Will Irving, *Economic Impacts on New Jersey of Upgrading PSE&G's Susquehanna-Roseland Transmission System* (May 2009), http://www.pseg.com/family/pseandg/powerline/pdf/rutgersjobreport.pdf.

configurations require greater than 150 feet in height. Spans would range from 600 to 700 feet between monopole towers and 800 to 1,000 feet between lattice towers.

The width of a transmission line's permanent ROW is generally determined by the voltage of the system and the need to provide for adequate setbacks for maintenance and reliability. A review of existing projects within Vermont indicates that typical width of an existing 345 kV ROW is approximately 150 feet wide. The transmission line clearing for construction purposes is dependent on the type of tower, topography, span, location, existing utility rights-of-way, and other factors. While the precise right-of-way would vary along sections of the lines, each transmission tower location would require a concrete foundation to ensure structural stability of the towers. The specific foundation requirements would be dependent on the geotechnical conditions at each tower location.

Constructing a new overhead transmission project, subject to the infrastructure requirements described above, in the State of Vermont would entail significant regulatory and permitting obstacles, encounter significant public opposition, require TDI-NE to acquire rights to (or condemn) hundreds of parcels of property, and substantially increase the impacts to the environment in comparison to the proposed project. While the Vermont Public Service Board has, in the last decade, approved two overhead transmission projects, the projects differed in significant aspects from the NECPL Project. Specifically, both projects had a significantly smaller footprint, are not HVDC, and are entirely Vermont-based projects.[18] Two overhead

[18] *See* Final Order Granting Certificate of Public Need at 11, *Petitions of Vermont Electric Power Company, Inc. (VELCO) and Green Mountain Power Corporation (GMP) for a certificate of public good, pursuant to 30 V.S.A. Section 248, authorizing VELCO to construct the so-called Northwest Vermont Reliability Project, said project to include: (1) upgrades at 12 existing VELCO and GMP substations located in Charlotte, Essex, Hartford, New Haven, North Ferrisburgh, Poultney, Shelburne, South Burlington, Vergennes, West Rutland, Williamstown, and Williston, Vermont; (2) the construction of a new 345 kV transmission line from West Rutland to New Haven; (3) the reconstruction of a portion of a 34.5 kV and 46 kV transmission line from New Haven to South Burlington; and (4) the reconductoring of a 115 kV transmission line from Williamstown to Barre, Vermont*, Docket No. 6860. January 28, 2005; Final Order Granting Certificate of Public Need at 4, *Joint Petition of Vermont Electric Power Company,*

projects of a similar scope to the NECPL Project were proposed in New York and New Hampshire and both encountered significant public opposition, regulatory uncertainty, and development risk.[19] Moreover, there would be a significant number of communities potentially impacted by the construction and operation of the Overhead Alternative. As with the Route 7 alternative, the Overhead Alternative would traverse some of Vermont's largest cities as well as numerous smaller communities. Where the alternative would traverse these communities, existing utility ROWs would, in many cases, need to be expanded to allow for construction access.

In addition to permitting and development risks, there would be significant logistical and environmental issues associated with the development of an overhead project. In particular, TDI-NE would likely need to site the 131 mile transmission line on a new transmission corridor or through an approximately 100' expansion of existing utility ROWs. Using publically available parcel databases which provided coverage for approximately 84% of the route, the Applicant identified that this alternative would cross 736 parcels. As such, the Applicant would be required to negotiate and execute or amend scores of easements with hundreds of landowners or condemn land through eminent domain. This would add significant burdens to the

*Inc., Vermont Transco, LLC, and Central Vermont Public Service Corporation for a certificate of public good, pursuant to 30 V.S.A. Section 248, authorizing the construction of the Southern Loop Transmission Upgrade Project.* Docket No. 7373. February 11, 2009.

[19] *See. e.g.*, New England States Committee on Electricity. Incremental Hydropower Imports Whitepaper. September 9, 2013 ("New Hampshire public officials note that the Northern Pass proposal faces significant hurdles to its implementation in its current form. Organized grass-roots opposition by citizens, advocacy groups and state and local elected officials, has led to apparent bipartisan opposition to the project in the New Hampshire Legislature."); NYRI Submits Notification that it is Suspending its Application filed under Article VII of the Public Service Law, *Application of New York Regional Interconnect, Inc. for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII for a high voltage direct current electric transmission line running between National Grid's Edic Substation in the Town of Marcy, and Central Hudson Gas & Electric's Rock Tavern Substation located in the Town of New Windsor*, Case No. 06-T-0650 (N.Y. P.S.C. Apr. 6, 2009), http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={7241B9D8-8B9C-4A92-B19E-4446DF4D0F9D}.

development process, engender litigation, foment public opposition, cause significant delay, and significantly increase the costs and risks of development.

Further, the proposed Overhead Alternative would likely increase the scope and breadth of environmental impacts, because of the construction effects on wetlands and RTE and uncommon species. As with the previous two alternatives, the Applicant assessed the potential environmental impacts associated with both of these routes (see Table 7-4). The acres of wetlands within close proximity to the overhead route as well as the number of stream crossings is in the hundreds, and access roads would need to be constructed for long segments of the route resulting in permanent wetland and stream impacts. These impacts occur to a much lesser extent on alternatives sited next to roads, which can generally be accessed without building construction roads. Greater densities of other resources (e.g. uncommon species and RTE species) were also identified in the vicinity of the Overhead Alternative in comparison to the proposed route, which is not unexpected as much of the route traverses areas which do not encounter regular human disturbance. In addition, the Overhead Alternative would have heightened adverse effects on aesthetics, a highly valued resource in the State of Vermont. For all of these reasons, TDI-NE does not believe that an Overhead Alternative is a practicable alternative.

**TABLE 7-4**
**ENVIRONMENTAL RESOURCES ASSOCIATED WITH OVERHEAD ALTERATIVE**

| CRITERIA | OVERHEAD ALTERNATIVE | PROPOSED PROJECT |
|---|---|---|
| **AQUATIC ECOSYSTEMS** | | |
| Acres of Wetlands within 50' of route segment (VSWI) | 150.0 | 12 |
| Acres of Wetlands within 100' of route segment (VSWI) | 300.0 | 37.2 |
| Acres of Wetlands within 50' of route segment (NWI) | 112.6 | 6.3 |
| Acres of Wetlands within 100' of route segment (NWI) | 226.2 | 19 |
| # of Stream Crossings | 204 | 70 |
| **NON-AQUATIC ECOSYSTEMS** | | |
| # of RTE species within 50' of route segment | 75 | 14 |
| # of RTE species within 100' of route segment | 79 | 14 |
| Acres of RTE species within 50' of route segment | 90.3 | 44.5 |
| Acres of RTE species within 100' of route segment | 176.3 | 71.9 |

| CRITERIA | OVERHEAD ALTERNATIVE | PROPOSED PROJECT |
|---|---|---|
| Acres of Significant Natural Communities within 50' of route segment | 5.4 | 0.6 |
| Acres of Significant Natural Communities within 100' of route segment | 14.7 | 5.23 |
| # of Uncommon species within 50' of route segment | 57 | 8 |
| # of Uncommon species within 100' of route segment | 59 | 9 |
| Acres of Uncommon species within 50' of route segment | 158.6 | 14.05 |
| Acres of Uncommon species within 100' of route segment | 311.8 | 28.8 |
| Acres of Deer Wintering Areas within 50' of route segment | 3.8 | 17.3 |
| Acres of Deer Wintering Areas within 100' of route segment | 31.2 | 44.2 |
| # of Public Water Source Protection Areas - Groundwater within 500' of route segment | 12 | 18 |
| # of Public Water Source Protection Areas – Surface Water within 500' of route segment | 2 | 0 |
| # of Hazardous Waste Sites within 500' of route segment | 9 | 15 |

## 7.6 Comparison of Practicable Alternatives

For the alternatives which were identified by the Applicant as practicable, TDI-NE evaluated each alternative's potential impacts to aquatic and terrestrial resources and other sensitive resources such as RTE species, wildlife habitat, or other resources.

### 7.6.1 Application of Criteria to Practicable Alternatives

TDI-NE evaluated the environmental impacts associated with the following alternatives as a part of three distinct geographic segments:

**Lake Segment Alternatives**

1. West Haven Alternative: Lake Champlain to West Haven
2. Benson Landing Alternative: Lake Champlain to Benson Landing *(Preferred Alternative)*

**Western Segment Alternatives**

3. Route 4 Alternative: Roadway ROW *(Preferred Alternative)*
4. Railroad Alternative West: Railroad ROW

**Eastern Segment Alternatives**

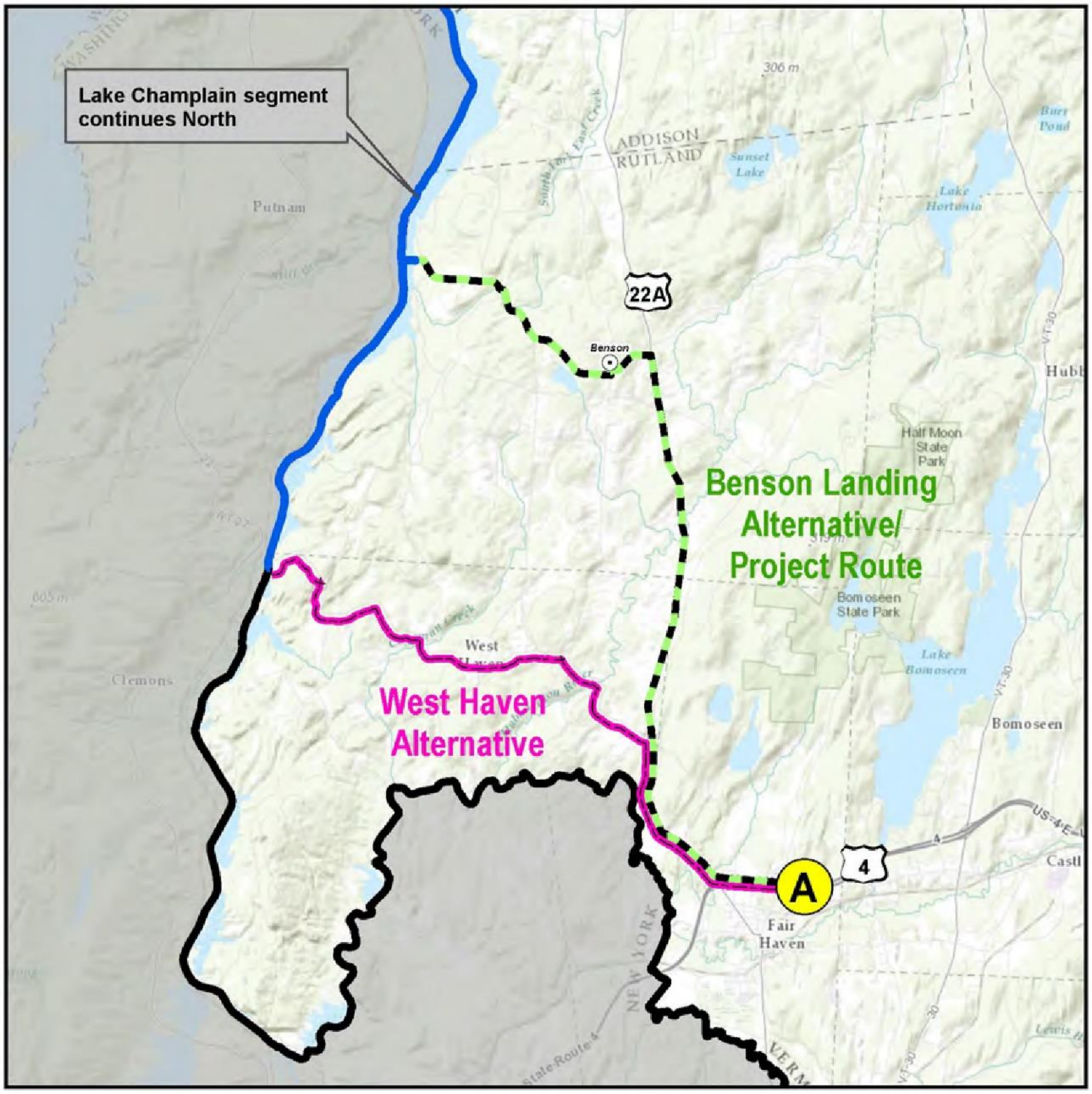
5. Route 103 Alternative: Roadway /Railroad ROW *(Preferred Alternative)*
6. Railroad Alternative East: Railroad/Roadway ROW
7. VELCO Alternative: VELCO ROW

For the three "Segments," the environmental impact of each alternative was assessed based on the environmental criteria discussed above. The results of the comparative impact analysis of the Project route and the identified alternatives are presented below.

7.6.2 Lake Champlain Segment (West Haven and Benson Landing Alternatives)

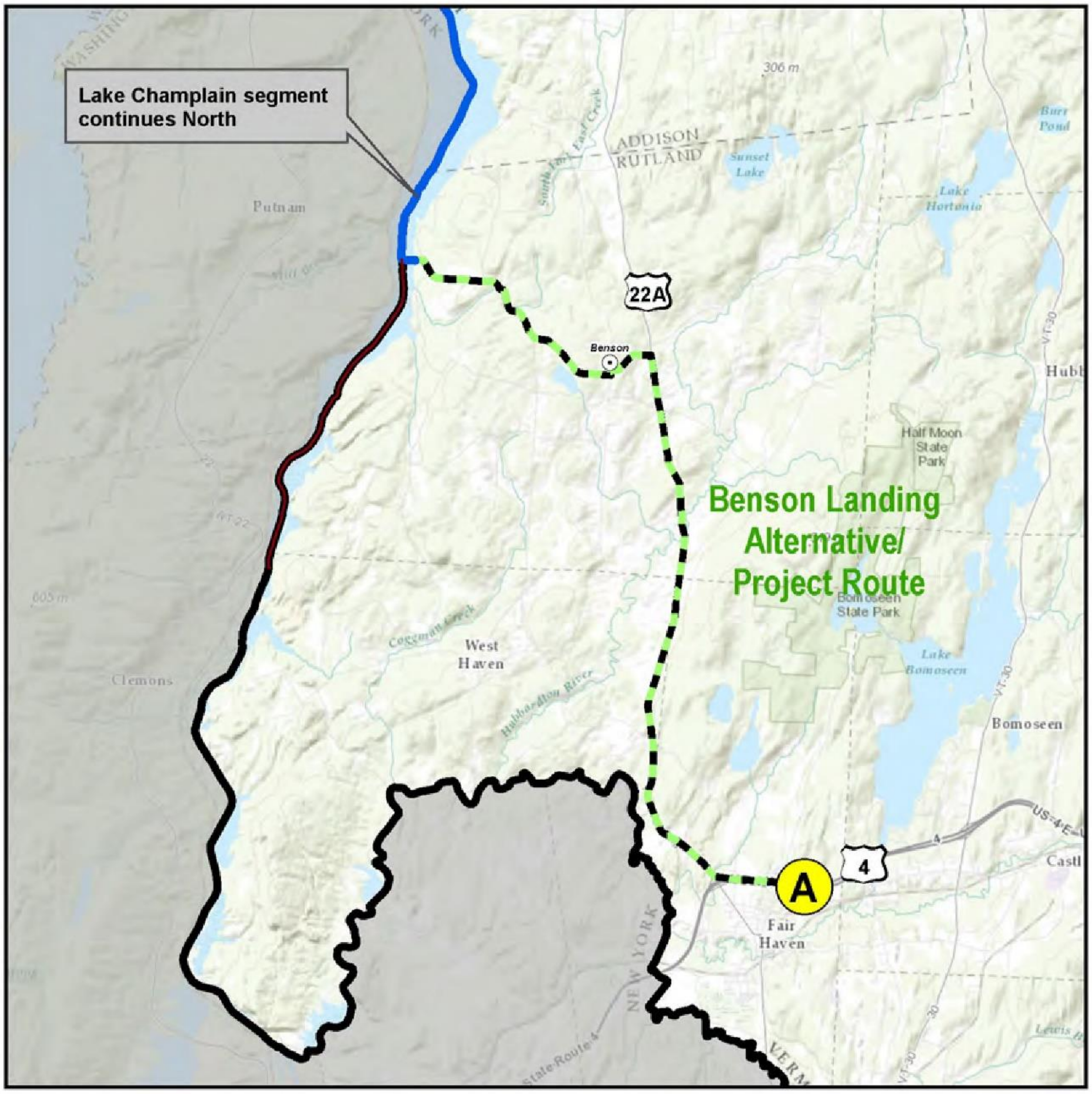
The West Haven Alternative would involve an approximately 0.3 mile underground segment in Alburgh, Vermont followed by approximately 100 miles south in Lake Champlain, entirely within the jurisdictional waters of the State of Vermont, exiting the lake via HDD in West Haven, Vermont. The routing would proceed east through West Haven along local roads (Grant Road, Cold Spring Road, Pettis Road, Burr Road, and Main Street) for approximately 8 miles before transferring to the Route 22A ROW. At this point the alternative would travel approximately 3.4 miles south to Route 4 in Fair Haven. This alternative is illustrated in Figure 7-4.

**FIGURE 7-4**
**WEST HAVEN ALTERNATIVE**




For the Benson Landing Alternative, the HVDC transmission line would be located underground within the Town of Alburgh, Vermont for approximately 0.5 miles. The HVDC transmission system will then enter Lake Champlain via HDD and be installed beneath, or in deeper waters on top of, the Lake Champlain lake bed for approximately 97.6 miles, entirely within the jurisdictional waters of the State of Vermont, to the Town of Benson, Vermont. The cable system would be installed underneath town roads for approximately 4.4 miles to Route 22A, at which point the transmission system would be within the Route 22A ROW south for approximately 8.1 miles to Route 4 in Fair Haven. This alternative is illustrated in Figure 7-5.

**FIGURE 7-5**
**BENSON LANDING ALTERNATIVE**




As shown in Table 7-5 below, the potential environmental impacts of the two alternatives are relatively similar, which is to be expected based on the similarities of settings (i.e. town and state roadways).

## TABLE 7-5
## COMPARISON OF LAKE CHAMPLAIN ALTERNATIVES

| CRITERIA | BENSON LANDING ALTERNATIVE | WEST HAVEN ALTERNATIVE |
|---|---|---|
| Overland Length (miles) | **110.6** | **111.9** |
| Estimated Total Cost ($millions) (including Lake Champlain installation) | **$405.8** | **$408.2** |
| Construction Access | Existing (TDI-NE property, public roads) | Public Roads; Unknown property for HDD. |
| **AQUATIC ECOSYSTEMS** | | |
| Acres of Wetlands within 50' of route segment (VSWI) | 2.7 | 0.8 |
| Acres of Wetlands within 100' of route segment (VSWI) | 8.0 | 3.1 |
| Acres of Wetlands within 50' of route segment (NWI) | 1.3 | 0.2 |
| Acres of Wetlands within 100' of route segment (NWI) | 3.6 | 1.5 |
| # of Stream Crossings | 17 | 13 |
| **NON-AQUATIC ECOSYSTEMS** | | |
| # of RTE species within 50' of route segment | 7 | 9 |
| # of RTE species within 100' of route segment | 7 | 10 |
| Acres of RTE species within 50' of route segment | 23.0 | 14.1 |
| Acres of RTE species within 100' of route segment | 29.2 | 27.2 |
| Acres of Significant Natural Communities within 50' of route segment | 0 | 0.9 |
| Acres of Significant Natural Communities within 100' of route segment | 0.03 | 1.8 |
| # of Uncommon species within 50' of route segment | 6 | 7 |
| # of Uncommon species within 100' of route segment | 6 | 8 |
| Acres of Uncommon species within 50' of route segment | 13.3 | 8.4 |
| Acres of Uncommon species within 100' of route segment | 26.5 | 16.6 |
| Acres of Deer Wintering Areas within 50' of route segment | 0.3 | 6.3 |
| Acres of Deer Wintering Areas within 100' of route segment | 1.5 | 14.3 |
| # of Public Water Source Protection Areas - Groundwater within 500' of route segment | 2 | 0 |
| # of Public Water Source Protection Areas – Surface Water within 500' of route segment | 0 | 0 |
| # of Hazardous Waste Sites within 500' of route segment | 2 | 0 |

In terms of wetlands, the VSGI and NWI acreages of wetlands within close proximity to the Benson Landing Alternative are higher than those for the West Haven Alterative. Based on consultations with Benson Town Officials, however, the Applicant intends to bury the cables within Benson town roadways so there would be minimal impact on wetlands along these roads.

Consequently, as demonstrated in Table 7-6, the difference in acreage of wetlands is minimal using VSWI data (i.e. .88 acres to .47 acres) and identical using NWI datasets.

**TABLE 7-6
COMPARISON OF LAKE CHAMPLAIN ALTERNATIVE SEGMENTS
WETLANDS ALONG ROUTE 22A**

| CRITERIA | BENSON LANDING ALTERNATIVE | WEST HAVEN ALTERNATIVE |
|---|---|---|
| Acres of Wetlands within 50' of Town Roads route segment (VSWI) | 1.86 | 0.27 |
| Acres of Wetlands within 50' of Route 22 /Route 4 segment (VSWI) | 0.88 | 0.47 |
| Acres of Wetlands within 50' of Town Roads route segment (NWI) | 1.16 | 0.13 |
| Acres of Wetlands within 50' of Route 22 / Route 4 segment (NWI) | 0.1 | 0.1 |

In looking at potential impacts to nearby natural resources and other sensitive features, each alternative has areas where it is superior or inferior to the other. The number of potential RTE and uncommon species is less for the Benson Landing Alterative but the potential acreage in close proximity is greater. As no detailed field studies have been conducted for West Haven, these impacts can be considered equivalent. The acres of Significant Natural Communities are comparable for the two routes, while the Benson Landing Alternative has less potential impact as measured by nearby acres of deer wintering acres.

The West Haven Alternative also poses certain environmental concerns that are not reflected in Table 7-5. The three mile in-water segment south of Benson Landing includes the Narrows of Lake Champlain Federal Navigation Channel which may require deeper burial. Deeper burial will increase temporary impacts to water quality associated with installation. Additionally, there are potential land use issues associated with the West Haven Alternative's proposed utilization of Grant Road, the closest Town Road to the lake. Based on aerial photography (see Figure 7-6), lakeside locations for an HDD staging area would likely require forest clearing near the Lake.[20]

[20] The only nearby location that would not require clearing is an apparent sand or gravel pit located to the south of the roadway. The installation of a HVDC transmission system, however, is incompatible with an area where excavation activities are regularly occurring. Moreover, the Applicant has no agreement with any landowner of a

As such, the Applicant believes that the Benson Landing Alternative represents preferred alternative in this segment.

**FIGURE 7-6**
**NARROWS OF LAKE CHAMPLAIN NEAR GRANT ROAD**
**WEST HAVEN, VERMONT**


7.6.3 Western Segment (Route 4 and Railroad ROW Alternatives)

From Fair Haven, the Route 4 Alternative would travel east within the Route 4 ROW to West Rutland for approximately 13 miles. This alternative is illustrated in Figure 7-7.

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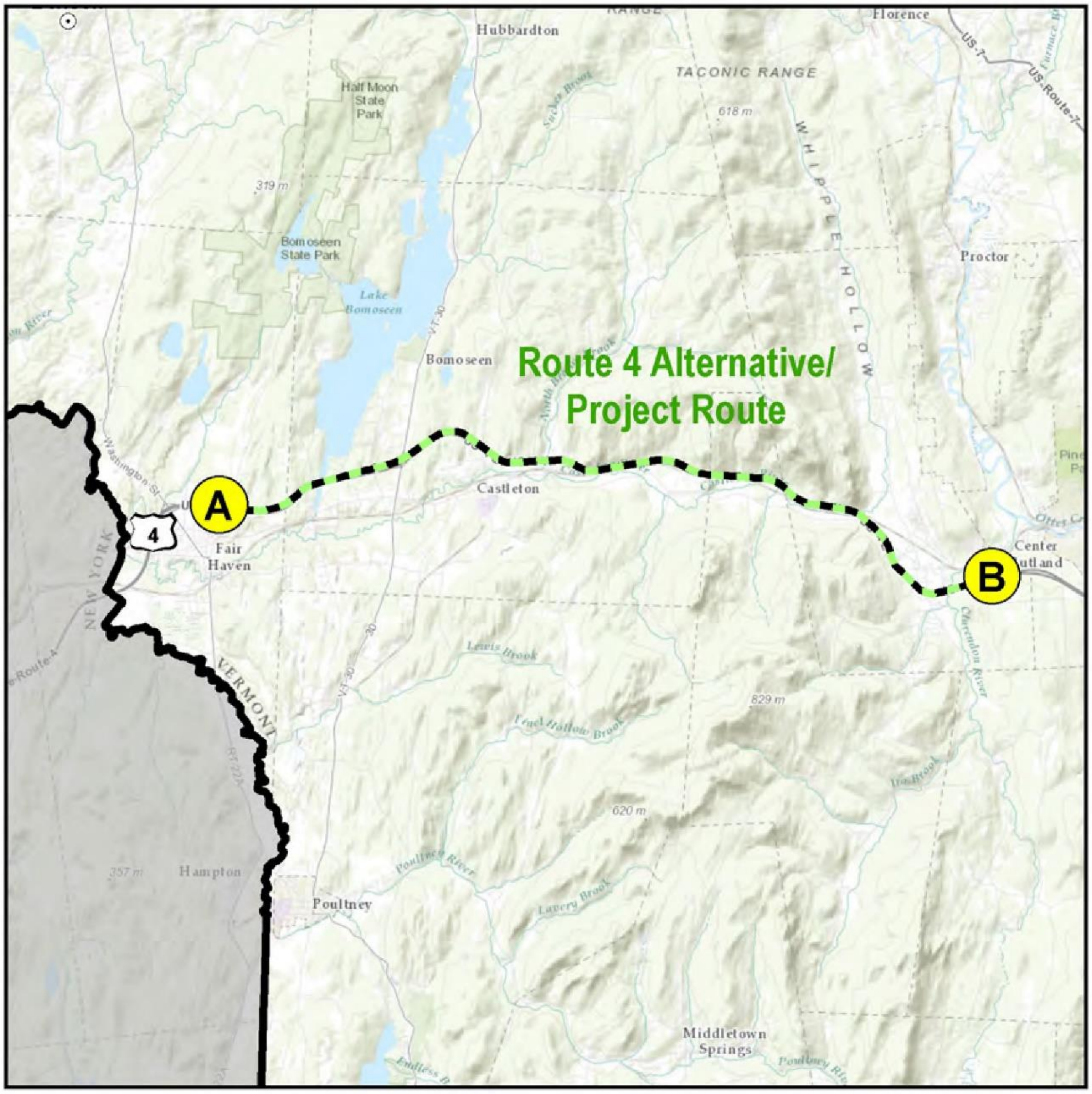
parcel that both borders the lake and Grant Road, which may render this alternative not practicable.

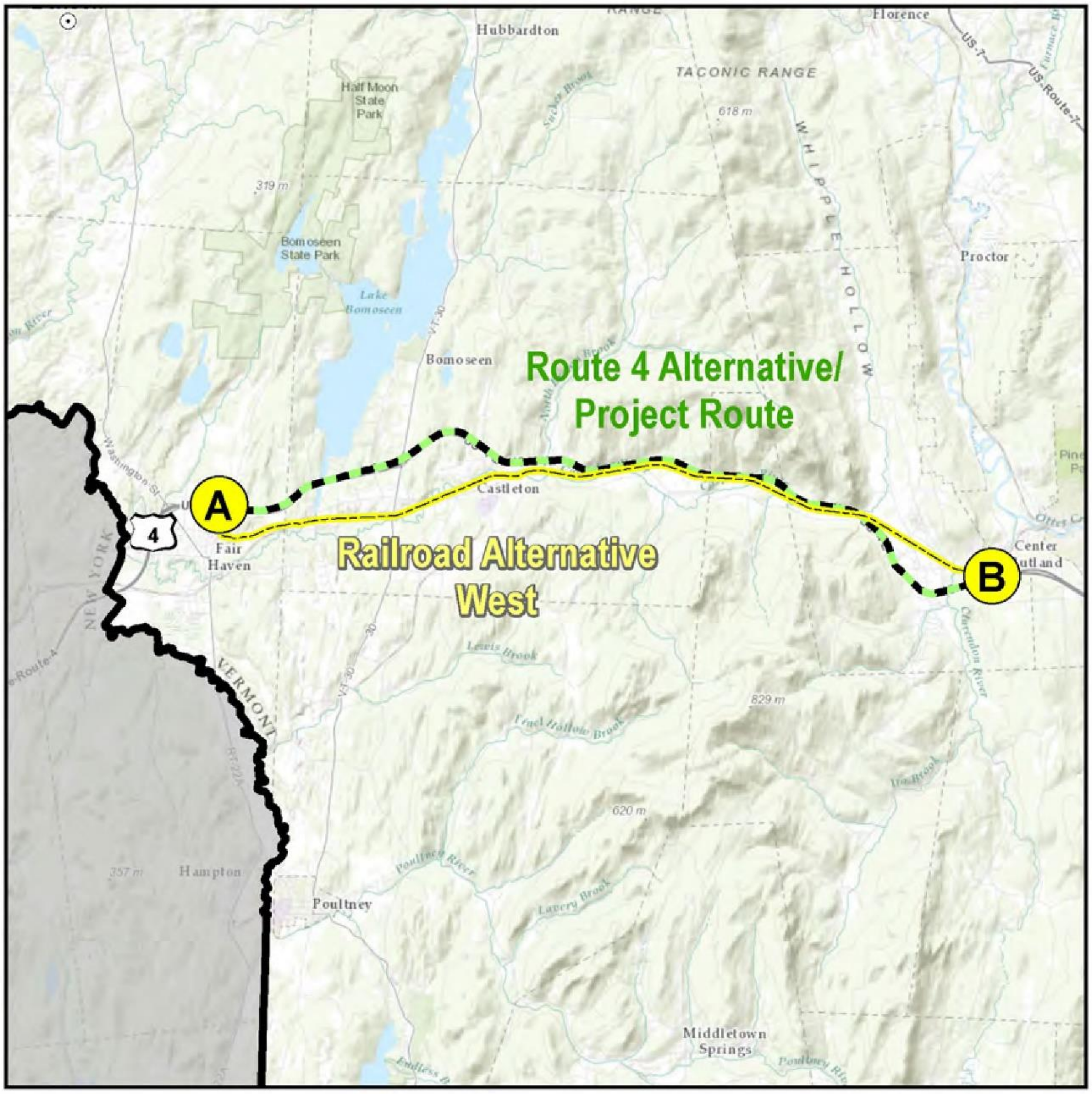
**FIGURE 7-7**
**ROUTE 4 ALTERNATIVE**




The Railroad Alternative would follow Route 4 from Fair Haven until its intersection with Route 4A, at which point the alternative would follow Route 4A and then enter the VTrans railroad ROW for approximately 11 miles. The cables would intersect with the Route 4 Alternative in West Rutland after a total distance of approximately 13 miles as well. This alternative is illustrated in Figure 7-8.

**FIGURE 7-8**

**RAILROAD ALTERNATIVE (WEST)**




Although the two alternatives are essentially equivalent in terms of length, the Route 4 Alternative is generally superior to the Railroad Alternative West in terms of the environmental resource categories (see Table 7-7). Most significantly, the acreage of wetlands within close proximity to the Railroad Alternative West are significantly greater than those reported for the Route 4 Alternative (i.e. .7 acres of VSWI wetlands within 50’ vs. 60.8 acres for the railroad Alternative). Further, based on visual observations of the railroad route during a “high-line” tour of this route in 2014, it is probable that significant impacts would occur during the installation of the cable as wetlands are often present on both sides of the railroad track ballast. In the majority of other categories, the Route 4 Alternative has the same or less resources within the selected assessment area. For those areas where the Railroad Alternative West showed less potential environmental impact, the values reported are sufficiently close. Further, the road ROW is maintained via ongoing vegetation maintenance by VTrans and so any known resources are already likely to be impacted. In contrast, the railroad ROW tracks and ballast are the only areas that receive ongoing maintenance. Accordingly, it is the Applicant's belief that the Route 4 Alternative represents the preferred alternative.

**TABLE 7-7**
**COMPARISON OF WESTERN SECTION ALTERNATIVES**

| CRITERIA | ROADWAY ALTERNATIVE | RAILROAD ALTERNATIVE |
|---|---|---|
| Overland Length (miles) | **13** | **13** |
| Estimated Total Cost ($millions) | **$68.9** | **$73.1** |
| Construction Access | Roadway | Roadway, access roads likely needed |
| **AQUATIC ECOSYSTEMS** | | |
| Acres of Wetlands within 50' of route segment (VSWI) | 0.7 | 60.8 |
| Acres of Wetlands within 100' of route segment (VSWI) | 4.7 | 128.9 |
| Acres of Wetlands within 50' of route segment (NWI) | 1.1 | 44.8 |
| Acres of Wetlands within 100' of route segment (NWI) | 3.6 | 93.4 |
| # of Stream Crossings | 19 | 13 |
| **NON-AQUATIC ECOSYSTEMS** | | |
| # of RTE species within 50' of route segment | 3 | 1 |
| # of RTE species within 100' of route segment | 3 | 2 |
| Acres of RTE species within 50' of route segment | 9.1 | 0.4 |
| Acres of RTE species within 100' of route segment | 18.4 | 0.9 |
| Acres of Significant Natural Communities within 50' of route segment | 0 | 2 |
| Acres of Significant Natural Communities within 100' of route segment | 0 | 5.1 |
| # of Uncommon species within 50' of route segment | 0 | 4 |
| # of Uncommon species within 100' of route segment | 1 | 4 |
| Acres of Uncommon species within 50' of route segment | 0.0 | 5.8 |
| Acres of Uncommon species within 100' of route segment | 0.1 | 12.2 |
| Acres of Deer Wintering Areas within 50' of route segment | 0.0 | 0.0 |
| Acres of Deer Wintering Areas within 100' of route segment | 3.7 | 0.0 |
| # of Public Water Source Protection Areas - Groundwater within 500' of route segment | 8 | 10 |
| # of Public Water Source Protection Areas – Surface Water within 500' of route segment | 0 | 0 |
| # of Hazardous Waste Sites within 500' of route segment | 2 | 5 |

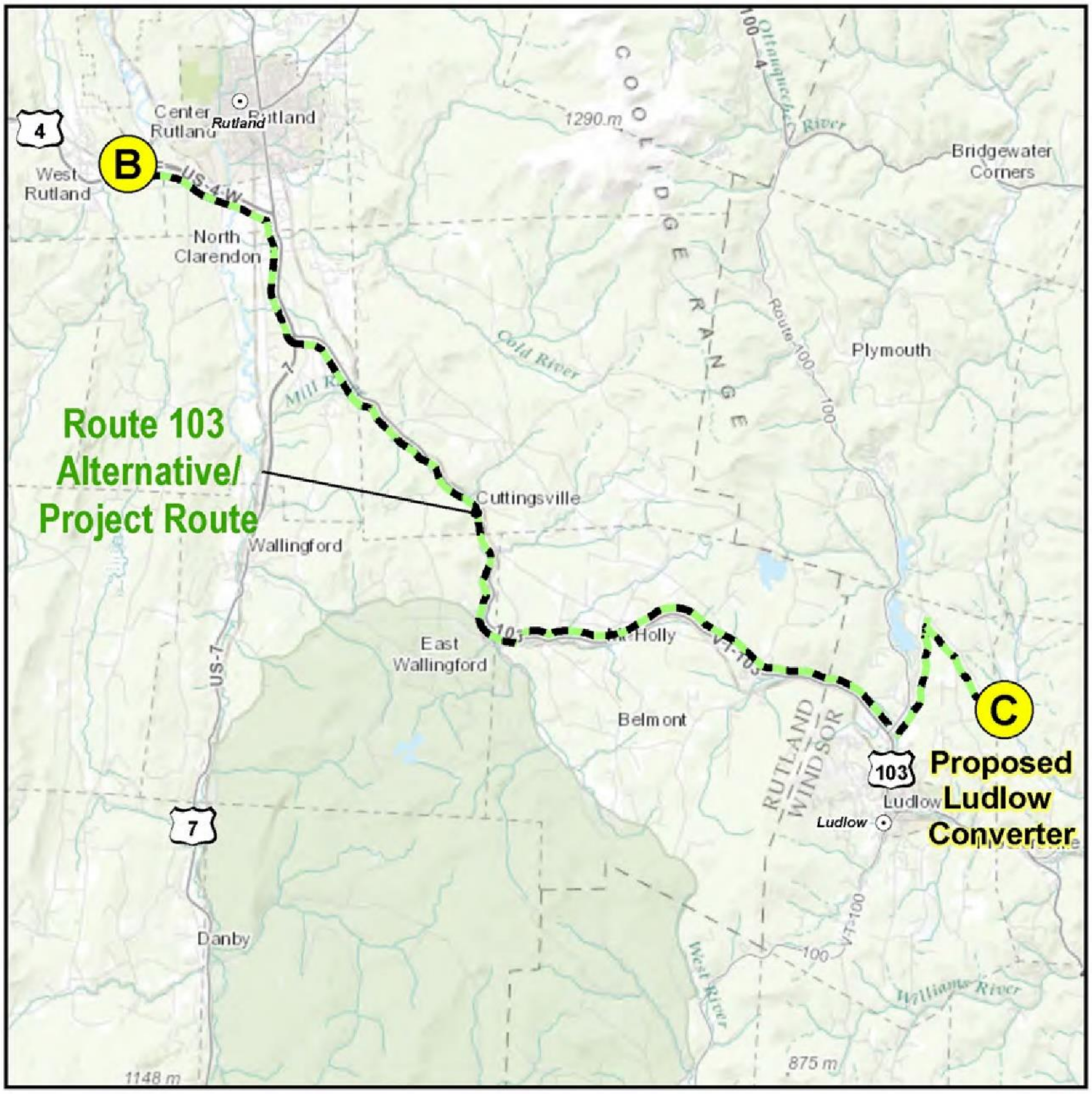
### 7.6.4 Eastern Segment (Route 103, Railroad ROW, VELCO ROW)

The Route 103 Alternative would travel within the Route 4 ROW for approximately 4.2 miles east to Route 7 in Rutland, then approximately 2.6 miles south to Route 103 in North Clarendon.

The transmission system would travel approximately 3.9 miles in the Route 103 ROW, and then enter the VTrans Railroad ROW in Shrewsbury, Vermont to bypass the historic village of Cuttingsville.[21] The route would be within the railroad ROW for approximately 3.5 miles, then re-enter the Route 103 ROW in Wallingford, Vermont. After approximately 10.4 miles along the Route 103 ROW, the route would travel north on Route 100 for almost one mile before intersecting with a town road. The cables will be laid within the ROW or underneath town roads for approximately 4.8 miles before reaching the Ludlow HVDC Converter Station. The total length of this alternative would be approximately 26 miles with 22.5 miles along road ROWs and 3.5 miles along the railroad ROW. This alternative is illustrated in Figure 7-9.

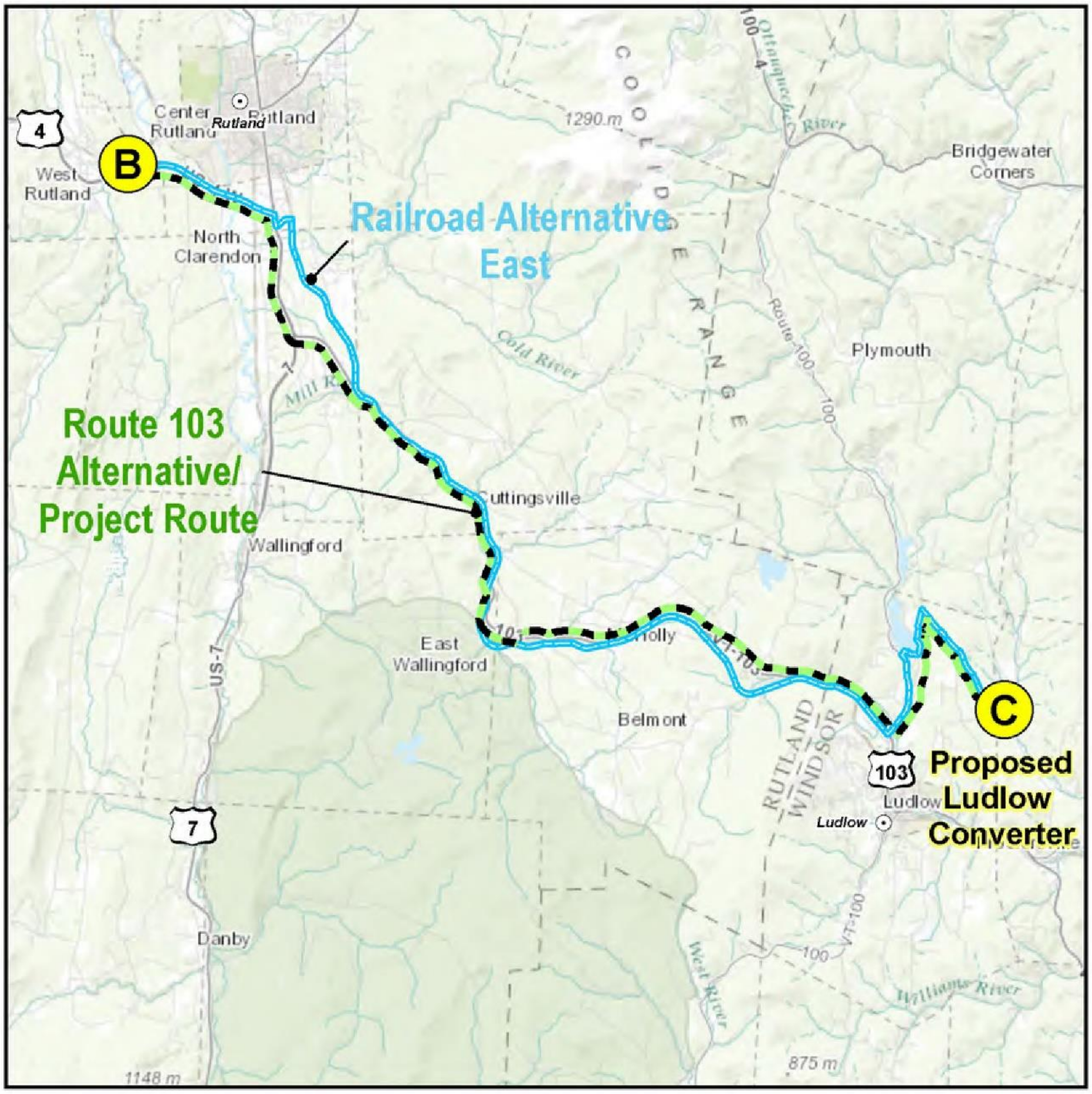
[21] For the Route 103 Alternative, the Applicant originally proposed to have this route continue on Route 103 through Cuttingsville rather than utilize the nearby segment of railroad ROW. The original routing proposal was reflected in the Applicant's application for a Presidential Permit pending before the U.S. Department of Energy. However, after further investigation and evaluation, the Applicant has determined that the original routing would involve construction in a narrow section of VTrans ROW within one of the most densely populated stretches of the entire route with multiple businesses. In addition, the relocation to the railroad ROW avoids two very challenging HDDs that could potentially impact existing bridges. In addition, large stretches of the original routing are within Fluvial Erosion Hazard and Floodplain areas. Lastly, the Village of Cuttingsville is a Vermont Historic District that has over 30 potential or listed historic structures, many very close to the roadway, raising the potential for temporary or permanent impacts to these cultural resources due to the narrow area available for construction.

**FIGURE 7-9**
**ROUTE 103 ALTERNATIVE (PROJECT ROUTE)**



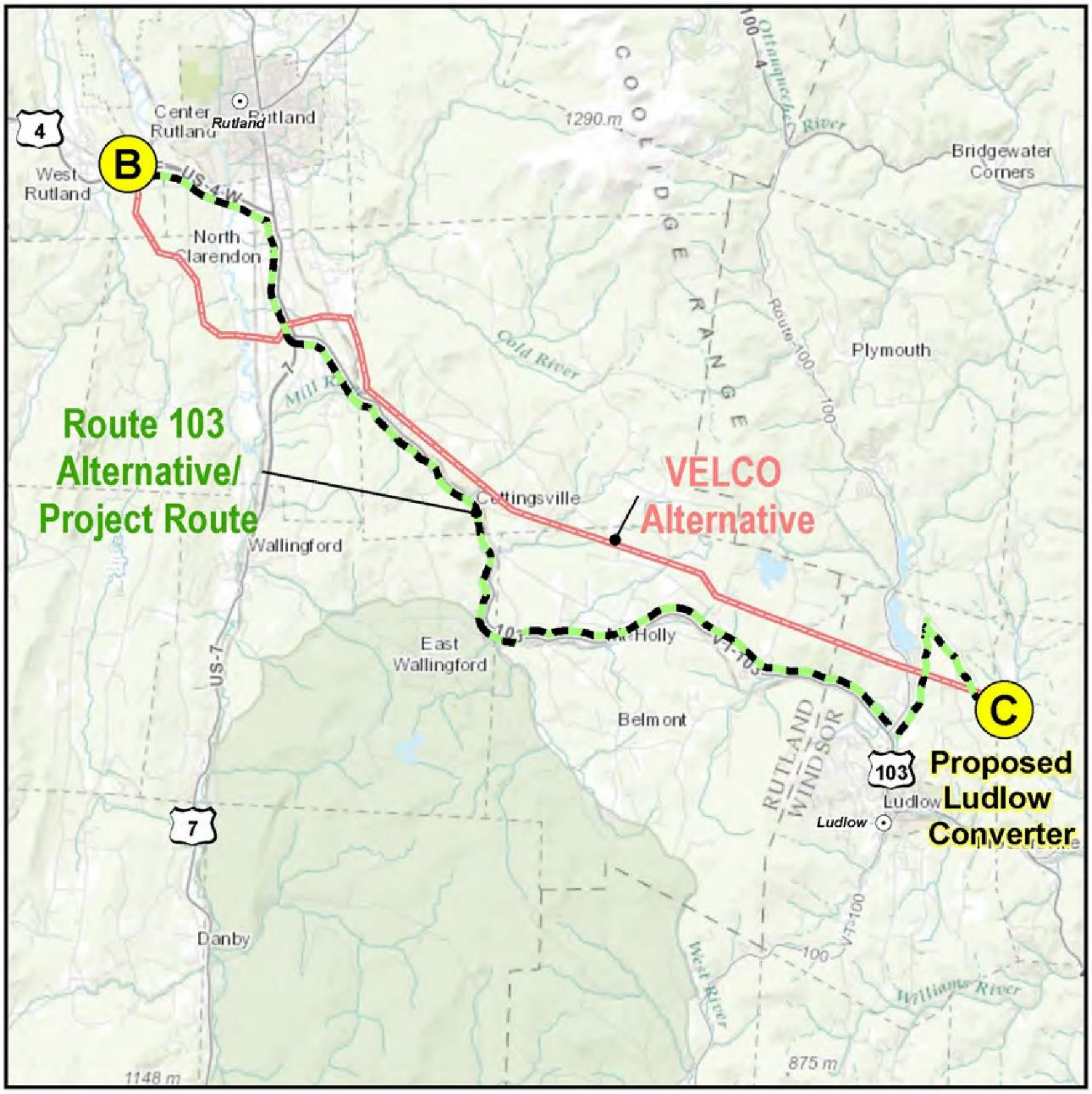

For the Railroad Alternative (East), the first 6.8 miles of this alternative would be the same as the Route 103 Alternative, but would enter the railroad ROW south of the intersection of Route 4 and Route 7 in Rutland, traveling south, then east, for 20.3 miles to Route 103 in Ludlow where the final 5.8 miles would follow Route 100 and local roads as depicted in the Route 103 Alternative. The total length of this alternative would be approximately 30.8 miles to the proposed converter station location, with approximately 23.3 miles in railroad ROW and 7.5 miles in roadway ROW. This alternative is illustrated in Figure 7-10.

**FIGURE 7-10**
**RAILROAD ALTERNATIVE EAST**




The VELCO Alternative would transition from the Route 4 ROW in West Rutland to enter the VELCO ROW. The cable system would then travel south / south east for approximately 24 miles to the proposed converter station location within this existing ROW. This alternative is illustrated in Figure 7-11.

**FIGURE 7-11**
**VELCO ALTERNATIVE**




The comparison of the three alternatives in terms of the potential impacts to aquatic and non-aquatic ecosystems indicated that the Route 103 Alternative is generally superior to the other two (see Table 7-8) across all criteria except for streams crossed, deer wintering areas, groundwater public water source protection areas and hazardous waste sites. The Applicant believes that the resource impacts associated with the Route 103 Alternative will actually be lower than the GIS analysis suggests. The majority of the streams along the Route 103 Alternative are in culverts and therefore the Applicant will generally avoid in-stream activities. Deer wintering areas will likely not be impacted, because the cables are generally proposed to be installed in existing cleared areas. The number of surface water public water source protection areas does not significantly differ among the three options and any hazardous waste sites near the Route 103 Alternative will be identified and appropriate construction practices would be followed. In comparison to the Route 103 Alternative, the VELCO ROW has very little existing infrastructure (e.g. bridges, culverts, and existing roads) that the Applicant can utilize to minimize impacts to streams and wetlands. As such, greater resource impacts would be anticipated along the Railroad Alternative (East) and VELCO Alternatives.

**TABLE 7-8**
**COMPARISON OF EASTERN SECTION ALTERNATIVES**

| CRITERIA | ROUTE 103 ALTERNATIVE | RAILROAD / ROADWAY ALTERNATIVE | VELCO ALTERNATIVE |
|---|---|---|---|
| Overland Length (miles) | 29.6 | 30.8 | 24.0 |
| Estimated Total Cost ($millions) | $156.3 | $172.18 | $125.41 |
| Approximate Number of Permanent Easements | 0 | 0 | 120 |
| Construction Access | Roadway | Roadway, Railroad, new access roads | New access roads |
| **AQUATIC ECOSYSTEMS** | | | |
| Acres of Wetlands within 50’ of route segment (VSWI) | 8.6 | 16.0 | 21.2 |
| Acres of Wetlands within 100’ of route segment (VSWI) | 24.5 | 37.4 | 41.2 |
| Acres of Wetlands within 50’ of route segment (NWI) | 3.9 | 14.0 | 6.2 |
| Acres of Wetlands within 100’ of route segment (NWI) | 11.8 | 32.2 | 11.8 |
| # of Stream Crossings | 34 | 43 | 22 |
| **NON-AQUATIC ECOSYSTEMS** | | | |
| # of RTE species within 50’ of route segment | 4 | 4 | 8 |
| # of RTE species within 100’ of route segment | 4 | 4 | 8 |
| Acres of RTE species within 50’ of route segment | 12.4 | 18.6 | 26.0 |
| Acres of RTE species within 100’ of route segment | 24.3 | 37.2 | 50.8 |
| Acres of Significant Natural Communities within 50’ of route segment | 0.60 | 11.7 | 3.2 |

| CRITERIA | ROUTE 103 ALTERNATIVE | RAILROAD / ROADWAY ALTERNATIVE | VELCO ALTERNATIVE |
|---|---|---|---|
| Acres of Significant Natural Communities within 100’ of route segment | 5.2 | 23.4 | 5.5 |
| # of Uncommon species within 50’ of route segment | 2 | 3 | 6 |
| # of Uncommon species within 100’ of route segment | 2 | 3 | 7 |
| Acres of Uncommon species within 50’ of route segment | 0.75 | 9.2 | 1.6 |
| Acres of Uncommon species within 100’ of route segment | 2.2 | 11.4 | 2.7 |
| Acres of Deer Wintering Areas within 50’ of route segment | 17.0 | 19.9 | 0.0 |
| Acres of Deer Wintering Areas within 100’ of route segment | 39.0 | 47.1 | 4.5 |
| # of Public Water Source Protection Areas - Groundwater within 500’ of route segment | 8 | 6 | 4 |
| # of Public Water Source Protection Areas – Surface Water within 500’ of route segment | 0 | 0 | 0 |
| # of Hazardous Waste Sites within 500’ of route segment | 11 | 0 | 5 |

In addition, the VELCO Alternative has similar practicality concerns as the Overhead Alternative, albeit on a smaller scale. In terms of the likely number of easements, 60 parcels were identified along the 11.64 miles (48%) of the route where parcel coverage existed. As the areas without coverage are in the greater Rutland area, it is reasonable to assume at least another 60 more landowners for a total of approximately 120 easements would need to be executed or amended in order to gain access to the VELCO ROW.[22] Moreover, construction access roads would need to be built along stretches of the VELCO ROW and to a lesser extent the Railroad ROW. These access roads would likely result in permanent impacts to streams and wetlands and

[22] The Applicant has been informed by VELCO that, due to certain legal uncertainties, it should be assumed that the existing VELCO easements would not allow for a buried transmission line.

temporary impacts to sensitive species and habitats. Moreover, VELCO has not granted permission to put the transmission line within its ROW. If permission is granted, TDI-NE expects that additional forested ROW would need to be cleared to accommodate the ROW, as VELCO would not want to encumber its existing cleared ROW with a buried transmission line. This required clearing would be expected to result in additional impacts to natural resource features. Accordingly, the Applicant believe that the Route 103 Alternative is the preferred alternative for this segment.

### 7.7 Conclusion

Pursuant to the Guidelines implementing Section 404(b)(1) of the CWA, the USACE must determine whether a proposed project is the least environmentally damaging practicable alternative. To assist in the USACE's analysis, TDI-NE evaluated the practicability of various alternatives, and analyzed the resource impacts associated with each alternative. Based on the analysis set forth above, TDI-NE believes the preferred alternative satisfies the requirements of Section 404 (b)(1) of the CWA as the least environmentally damaging practicable alternative.