Port Angeles-Juan de Fuca Transmission Project

Draft Environmental Impact Statement

DOE/EIS-0378

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Department of Energy

Office of Electricity Delivery and Energy Reliability
and
Bonneville Power Administration

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Responsible Agency: U.S. Department of Energy (DOE), Office of Electricity Delivery and Energy Reliability (OE), and Bonneville Power Administration (BPA)

Title of Proposed Project: Port Angeles-Juan de Fuca Transmission Project

State Involved: Washington

Abstract: Sea Breeze Olympic Converter LP (Sea Breeze) has applied to DOE for authorizations and approvals necessary to construct the U.S. portion of an international electric power transmission cable. Sea Breeze's proposed cable would extend from the greater Victoria area, British Columbia, Canada, across the Strait of Juan de Fuca to Port Angeles, Clallam County, Washington, U.S. The U.S. portion is referred to as the Port Angeles–Juan de Fuca Transmission Project. Sea Breeze has applied to DOE/OE for a Presidential permit for the international crossing of the cable and to BPA for interconnection into the federal transmission system.

The Proposed Action involves the installation of a ±150-kilovolt direct-current (DC) transmission line cable, which could carry up to 550 megawatts of power. About 10.5 miles (16.9 km) of the marine cable would be trenched in the sea floor from the international boundary to the Port Angeles Harbor. The cable would transition from the marine environment in the Harbor to land through a horizontal-directionally-drilled hole. The DC cable would then proceed underground through city streets for about 0.8 mile (1.3 km) to a new converter station. The converter station would convert power from DC to alternating current (AC). A 1,000-foot (305-m) long underground AC cable would then connect into BPA's Port Angeles Substation. The Port Angeles Substation would be expanded to accommodate the interconnection of power into the federal transmission system.

Sea Breeze would construct and own the proposed cable project. Sea Breeze intends to sell capacity on the cable to interested utilities or generators (through open access), with power flow possible both north and south between the U.S. and Canada. Because the proposed project does not include improvements that would increase the capacity of BPA's transmission system, power flow to and from the proposed interconnection with BPA's system would be subject to existing power transfer limits and transmission constraints.

DOE/OE and BPA are also considering a No Action Alternative in which Sea Breeze's requests would be denied, and the project would not receive a Presidential permit and could not interconnect with the federal transmission system.

The proposed project could create impacts to water resources, vegetation, marine habitat and wildlife, terrestrial wildlife and freshwater fish, soils, land use, visual resources, socioeconomics, cultural resources, noise, health and safety, and air quality. Chapter 3 of the EIS describes impacts in detail.

Public comments are being accepted through April 24, 2007.

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For additional information on DOE NEPA activities, please contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, GC-20, U.S. Department of Energy, 1000 Independence Avenue S.W., Washington D.C. 20585-0103, phone: 1-800-472-2756 or visit the DOE NEPA Web site at www.eh.doe.gov/nepa.

Table of Contents

Appendices

List of Tables

List of Figures

Summary

This summary includes information regarding the following elements of the draft environmental impact statement (EIS) prepared for the Port Angeles-Juan de Fuca Transmission Project:

- purpose and need for action;
- Proposed Action and No Action Alternative; and
- affected environment, environmental impacts, and mitigation measures.

S.1 Purpose and Need for Action

Sea Breeze Olympic Converter LP (Sea Breeze) has applied to the United States Department of Energy (DOE) for authorizations and approvals necessary to construct the U.S. portion of a proposed international electric power transmission cable. Specifically, Sea Breeze has applied to the Office of Electricity Delivery and Energy Reliability (DOE/OE), an organizational unit within DOE, for a Presidential permit for its project. Sea Breeze has also submitted a request to Bonneville Power Administration (BPA), another organizational unit within DOE, for interconnection into the federal transmission system.

The purpose and need for DOE/OE's action is to respond to Sea Breeze's request for a Presidential permit. DOE/OE may issue or amend a Presidential permit if it determines that the action is in the public interest and after obtaining favorable recommendations from the U.S. Departments of State and Defense. In determining whether issuance of a permit is in the public interest, DOE/OE considers the environmental impacts of the proposed project pursuant to the National Environmental Policy Act (NEPA), the project's impact on electric reliability, and any other factors that DOE/OE may consider relevant. If DOE/OE determines that issuing the Presidential permit would be in the public interest, the information contained in this EIS will provide the basis for DOE/OE to decide which alternative(s) to authorize and which mitigation measures, if any, would be appropriate for inclusion as conditions of the permit.

BPA needs to respond to Sea Breeze's request to connect to the transmission system. BPA owns and operates the federal transmission system in the Pacific Northwest. BPA has adopted an Open Access Transmission Tariff in which the procedures provide for new interconnections to the transmission system to all eligible customers, consistent with all BPA requirements and subject to an environmental review under NEPA.

In making a decision concerning Sea Breeze's request to interconnect, BPA will consider the following purposes or objectives.

- Maintenance of transmission system reliability.
- Consistency with BPA's environmental and social responsibilities.
- Cost efficiencies.

S.1.1 Public Involvement

Early in the development of this EIS, DOE solicited input from the public, agencies, and others to help determine what issues should be studied in the EIS. DOE requested comments through publishing notices in the Federal Register, mailing a letter requesting comments to about 415 people and agencies, holding a public open-house style meeting, and meeting with state and federal regulatory agencies. Most of the scoping comments received by DOE focused on three areas: the need for and scope of the project, questions about project details, and potential impacts on biological resources.

S.1.2 Issues Outside the Scope of the Proposed Action or This EIS

Though most of the issues raised during scoping or in early planning are considered to be within the scope of the Proposed Action and are addressed in this EIS, five issues raised are considered to be either beyond the scope of this EIS (and thus not addressed in this EIS) or are outside the scope of the Proposed Action. These five issues include the following: 1) impacts in Canada, 2) any Olympic Peninsula transmission line improvements to remove transmission constraints to allow for the full 550-MW flow of power to and from the proposed interconnection, 3) BPA's proposed Olympic Peninsula Reinforcement Project, 4) a separate request by Sea Breeze to interconnect at BPA's Fairmount Substation, and 5) alternative electric power sources.

S.2 Proposed Action

DOE/OE's Proposed Action would be to grant Sea Breeze a Presidential permit for the international border crossing of the proposed cable. BPA's Proposed Action would be to allow the proposed cable to connect into the federal transmission system at BPA's Port Angeles Substation. The interconnection would allow power flow over BPA's system to the extent that capacity on the system is available.

With federal approvals granted, Sea Breeze could construct the portion of its proposed cable project that would be located in the U.S., i.e., the Port Angeles-Juan de Fuca Transmission Project. The proposed direct-current (DC) transmission cable would be about 32 miles (52 kilometers [km]) long starting from a new converter station in Victoria, B.C., Canada, and terminating at BPA's existing Port Angeles Substation in Port Angeles, Washington (see Figure S-1). The cable would cross both land and sea under Canadian and U.S. jurisdictions.

The proposed project evaluated in this EIS is the portion of the cable that would be located in U.S. jurisdiction. There are six main components of the Proposed Action: 1) a marine DC cable, 2) a horizontal-directional-drill (HDD) hole for the DC cable, 3) a terrestrial DC cable, 4) a converter station, 5) a terrestrial alternating current (AC) cable, and 6) interconnection work at BPA's Port Angeles Substation. These components are described briefly below and described in detail in Chapter 2 of the EIS.

Direct and Alternating Current

Electrical systems operate via direct current (DC) or alternating current (AC). DC is constant over time, while AC varies, or cycles, over time in both magnitude and polarity. The frequency of these AC cycles is expressed in Hertz (Hz), which is the number of cycles per second (i.e., 1 Hz is equal to one cycle per second). Typically in North America, AC systems operate at 60 Hz. Battery-operated devices and tools, including flashlights, cordless drills, automobiles, golf carts, tractors, etc., use DC. Direct current also is sometimes used in transmission lines to move electricity over long distances, but it requires converter stations at each end to convert AC to DC and back again from DC to AC prior to being connected to a local distribution system.

S.2.1 Marine DC Transmission Cable

About 10.5 miles (17 km) of the DC cable would be in the marine environment under U.S. jurisdiction. The marine transmission cable would be a ±150-kV DC cable with two copper conductors. The conductors would be insulated, strengthened with high tensile strength steel wire, sheathed in thick polypropylene yarn, and bundled together as one cable. The cable would not contain fluids or oil-impregnated insulation and would likely include a fiber optics cable for possible future use for communications.

A specialized cable-laying ship would be used to install the marine cable and would use lighting during nighttime construction periods for operation and crew safety.

The proposed marine cable would be buried in a trench (typically 3 to 5 feet [1 to 1.5 meter] deep and about 4 feet [1.2 m] wide) for most of its length across the Strait. Actual trench depth and width would vary depending on sea bed conditions encountered and existing uses that could disturb the cable. In some areas, the cable may rest on the sea floor if trenching is impossible. Sea Breeze has identified a 1-mile (1.6-km) wide cable corridor across the Strait in which the marine cable would be placed. In the United States, this corridor extends from the U.S.-Canada international boundary at about 48° 15' 6.4829 latitude and 123° 24' 27.7963 longitude to a point in the Port Angeles Harbor of Port Angeles, Washington.

The southern end of the proposed marine cable would enter the Port Angeles Harbor about 0.93 mile (1.5 km) to the east of Ediz Hook point. About 1,340 feet (408 m) from shore, where the cable would reach a water depth of about 26 to 30 feet (8 to 9 m), the cable would be pulled through a horizontal-directional-drilled (HDD) hole to transition from the sea floor to land.

Sea Breeze would use one or more of three possible methods to trench the cable into the sea floor: using a sea plow, hydro-jetting, or using a hydroplow. Under all three trenching methods, most of the sea floor sediment disturbed during trenching would be expected to fall back into the trench and bury the cable immediately after the cable is placed in the trench.

In some areas, such as where the sea bed is rocky or already trenched for other utility cables, a new trench cannot be created for the proposed cable. If there is a danger that the cable laying on the sea floor could suffer physical damage from anchors or other hazards, the cable would need to be protected. The cable could be protected using a concrete or grout mattress over the cable, encasing the cable in a polyethylene sleeve, or placing rock fill over the cable. If the cable crosses other existing trenched utility cables, Sea Breeze would develop agreements with the utilities to determine which method to use to protect the proposed marine cable and the existing cables.

S.2.2 Horizontal Directional Drill Hole

The cable would transition from the sea bed to land through a proposed HDD hole, which would be between 13 and 15 inches (33 and 38 centimeters [cm]) in diameter. The hole would extend generally southwest from a point about 1,340 feet (408 m) offshore in Port Angeles Harbor, under the shoreline and bluff, to a point along North Liberty Street just south of Caroline Street in Port Angeles. The ocean water depth where the hole would emerge on the sea floor would be about 26 to 30 feet (8 to 9 m).

The hole would be bored using an HDD and would be a total of about 3,300 feet (1.0 km) long. All drilling would take place from the land. The drilling process would involve drilling a pilot hole, reaming or enlarging the pilot hole, and installing the casing pipe.

Both the piloting and reaming procedures would require the use of drilling fluids to flush the soil and rock particles from the drill hole, cool the drill bit, seal and support the drilled hole, and lubricate the hole. Drilling fluid or mud would consist of water and bentonite, a non-toxic, naturally-occurring clay.

Where the HDD hole would come to the surface in the Harbor, drilling muds would be released into the marine environment. The actual amount of drilling muds released would depend on the method used to ream out the hole, and whether the hole could be flushed out before it is punched through.

To facilitate the threading of the cable through the HDD hole, some excavation in the sea bed at the marine HDD end point may be required to provide a smooth curve in the sea floor to the hole. This excavated area would also be used to catch drilling fluids and soil cuttings so that they could be removed.

The HDD operation would disrupt through-traffic on that section of Liberty Street for the duration of the drilling operation, but access to local residents would be maintained. The HDD hole machinery would operate continuously for about 23 days, 24 hours a day, seven days a week. Continuous operation would be necessary in order to maintain hole stability and to prevent damage to the specialized equipment needed.

S.2.3 Terrestrial Direct Current Cable

Once the marine cable has been pulled through the HDD hole, it would be spliced to the terrestrial DC cable. From the Liberty Street HDD hole, the terrestrial cable would head southwest in a trench that would be dug under Liberty Street for about 0.8 miles (1.3 km). The underground cable would cross 11 streets, including Highway 101 and East Lauridsen Boulevard. The cable would then connect into the proposed converter station, which would be built between East Lauridsen Boulevard and East Park Avenue, near the BPA Port Angeles Substation.

The terrestrial cable would have two insulated copper conductors that would be larger than the marine cable, but without the additional corrosion protection needed for the marine cable.

Standard utility trenching methods would be used to underground the cable, including cutting and removing the asphalt, excavating the trench with backhoes, and using dump trucks to haul off the debris. The trench would be about 4 to 8 feet (1 to 2.5 m) deep and about 6 feet (2 m) wide at the surface. Some blasting would be required between E. 5th and E. 8th streets (about 600 feet [183 m]). Once construction is complete, all streets affected by the trenching activities would be repaved.

S.2.4 Converter Station

Because the cable would be DC and the BPA transmission grid is AC, a converter station would be required to convert the electricity from DC to AC. Sea Breeze has proposed construction of the converter station on about 5 acres (2 hectares [ha]) of land owned by Clallam County Public Utility District (PUD). The site is just north of BPA's Port Angeles Substation, between East Park Avenue and East Lauridsen Boulevard. The converter station would occupy about 3.75 acres (1.5 ha) of the site.

The proposed converter station would include a building and an electrical yard, with a fence enclosing most of the property. The proposed building would be about 100 feet (30 m) wide, 200 feet (60 m) long, and 40 feet (12 m) tall and the fence would be a combination of decorative and chain-link fencing.

Four existing overhead transmission lines that cross the property would need to be moved to make space for the converter station. These lines would need to be rebuilt and could be either reconfigured above ground across the property or buried under the converter station.

Construction of the proposed converter station would require grading and soil excavation, as well as some tree clearing. Clallam County PUD cleared trees on about one third of the property in 2004 when a 115-kV line was built. An additional 2 acres (0.8 ha) of trees of various sizes would be cleared on the site for the station. On the west side of the property, Sea Breeze plans to leave a 100-foot (30-m) wide buffer of trees and other vegetation, although large trees that would pose a potential wind fall hazard would be removed in this buffer area. Sea Breeze also intends to leave the existing tree buffer on the east side of the converter station site next to South Liberty Street. After construction, Sea Breeze would landscape the area surrounding the converter station.

S.2.5 Terrestrial Alternating Current Cable

AC power from the converter station would be transmitted to BPA's existing Port Angeles Substation via a proposed underground 230-kV AC transmission cable. The AC cable would exit the converter station on the southwest corner to the intersection of East Park Avenue and Porter Street and head south down Porter Street before entering the west side of BPA's Port Angeles Substation property. The length of the AC cable would depend on the routing option onto BPA property (see below), but would be less than 1,300 feet (396 m) long.

The cable would consist of three insulated conductors, buried either 18 or 24 inches (46 to 61 cm) apart within a concrete conduit. Standard utility trenching methods would be used to underground the cable. The trench would be about 4 to 6 feet (1 to 2.5 m) deep and about 6 feet (2 m) wide at the surface. The street would be repaired and repaved. During construction, control signs and personnel would direct traffic around the construction zone.

There are two short routing options for this 230-kV cable as it enters BPA property. Option A (BPA preferred) routes the cable down Porter Street for about 1,000 feet (305 m), then turns east onto BPA property. The cable would be a total of about 1250 feet (380 m) long under Option A. Option B routes the cable down Porter Street for about 711 feet (217 m), then turns southeast onto BPA property. The cable would be a total of about 1070 feet (327 m) long under Option B.

Trenching methods for the options across BPA property would be similar to those used in the street, except that no pavement would be removed and the backfill would include a final layer of top soil for plants to germinate. The area above the cable would need to remain clear of trees, but low-growing vegetation would be allowed to grow.

Two fiber cables would create a communication link between the converter station and the substation. One fiber cable would be placed in the trench with the terrestrial AC cable and the other fiber cable would enter substation property via a bore hole under East Park Avenue.

S.2.6 Port Angeles Substation Interconnection

The terrestrial AC cable would connect into BPA's Port Angeles Substation, which is located on the corner of East Park Avenue and Porter Street. The interconnection would require a new relay house about 36 feet by 20 feet (11 m by 6 m) and about 17-feet (5 m) tall, the relocation of an existing transmission line and other structures on BPA property, and the expansion of the existing electrical yard to accommodate new electrical equipment.

The electrical yard expansion would be south of the existing fence line on an undeveloped portion (about 2 acres [1 ha]) of BPA's property that has grasses, shrubs, and some trees. Because of the slope of the land in the expansion area, the electrical yard would be terraced.

One structure of an existing 115-kV transmission line entering the substation on the west side would need to be replaced and moved farther west by about 50 to 75 feet (14 to 23 m).

Some existing trees, including mature Douglas fir and hardwoods, would need to be removed for the yard expansion and the relocation of the existing transmission line. A 100-foot (30-m) wide corridor would be cleared of trees where the 115-kV transmission line would be relocated. Low-growing vegetation would be allowed to grow or be left in the corridor. Trees outside of the corridor that could potentially fall close enough to the line to cause an arc or electrical outage of the line would also be removed. About 2.4 acres (1.0 ha) of trees would be cut on the west side. Along Porter Street, the shorter deciduous trees or trees that would not pose a hazard to the line would remain. About 1 acre (0.4 ha) of trees would need to be cut on the east side.

Construction equipment would likely enter the site from an existing dirt access road from Porter Street. To accommodate vehicles (tractor/trailers) that require a large turning radius, BPA would widen the road approach to 50 feet (15 m). The existing access road would need to be graded and graveled to a 16-foot (5-m) wide road surface with side slopes.

S.2.7 Construction and Schedule

If DOE/OE and BPA decide to grant the necessary permits and approvals to Sea Breeze and Sea Breeze is granted appropriate permits required by other regulatory agencies, Sea Breeze could construct the U.S. portion of its proposed project. Construction could likely start sometime in 2007 and would be expected to be completed in about 12 to 18 months.

S.2.8 Operation and Maintenance

Sea Breeze or its successors in interest would be responsible for operating and maintaining all aspects of the proposed project except for the Port Angeles Substation equipment, which would be operated and maintained by BPA. Operation and control of the cable and converter station by Sea Breeze would be primarily conducted from a remote site, but there would be regularly scheduled site inspections and maintenance activities. For the proposed substation equipment, BPA would perform periodic maintenance and emergency repairs when necessary.

S.2.9 Transmission Service

In its request submitted to BPA, Sea Breeze has requested only interconnection of its proposed project to BPA’s transmission system, and has not requested transmission service over BPA’s system. Accordingly, the Proposed Action by BPA is only for interconnection of Sea Breeze’s project, and does not include any provision for transmission service. BPA would need to make a separate decision on any future request for transmission service related to Sea Breeze’s proposed project, and would include appropriate NEPA considerations in making such a decision.

In addition, Sea Breeze has proposed that its project be connected to BPA’s transmission system without any improvements made to this system. Sea Breeze believes that such an interconnection is both financially and operationally feasible, and they will accept restrictions on transmitting power across the system to maintain reliability. These restrictions will include limiting power flow from or to the new interconnection through the BPA transmission system on the Olympic Peninsula at certain times of the day and at certain times of the year. Any transmission service that is provided without system improvements would reflect these restrictions.

S.3 No Action Alternative

Under the No Action Alternative, DOE would deny Sea Breeze's request for a Presidential permit or deny the request to connect to the federal transmission system, or both. In either case, the Port Angeles–Juan de Fuca transmission cable would not be constructed as described and the potential environmental consequences due to the proposed project would not occur.

S.4 Affected Environment and Environmental Impacts

S.4.1 Water Resources

S.4.1.1 Affected Environment

The underwater portion of the project crosses the Strait of Juan de Fuca, a major marine surface water system, and approaches land through Port Angeles Harbor. The Strait is the primary connection between the Pacific Ocean and Puget Sound – Georgia Basin inland marine waterways. The upper 100-foot (30-m) layer is relatively fresh water created by river inflows. Below 100 feet (30 m), the lower layer is more saline from ocean-influenced inflow at depth. Tidal ranges average between 4 and 10 feet (1.2 and 3 m).

Water temperature in the Strait is well mixed and homogeneous during much of the year, although stratification can occur in late summer. In winter, the water temperatures range from 46 to 50°F (8 to 10°C). Summer temperatures range from 45°F (7°C) at depth to 68°F (20°C) at the surface (Thomson 1994). The water column in the nearshore area is mixed throughout the year with higher temperatures of water and substrate. The Strait is classified as Class AA marine water (extraordinary water quality).

The Port Angeles Harbor is contained within Ediz Hook, a 4-mile (6.4-km) sand spit (see Figure S-1). The marine waters of Port Angeles Harbor are currently listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act due to low dissolved oxygen levels and past discharges of wastewater from the former Rayonier pulp mill.

The project is in the vicinity of three creeks (White Creek, Ennis Creek, and Peabody Creek) that flow from the foothills of the Olympic Mountains into the Strait. Ennis Creek, below its confluence with White Creek, and the entire reach of White Creek within the general project area have been classified as impaired or compromised by Clallam County (Clallam County 2004). Peabody Creek is a small rain-dominated drainage that enters Port Angeles Harbor in the downtown area and is listed on the Washington State 303d list as a Category 5 polluted waters. In the vicinity of the project, the creeks have limited channelized floodplains.

In the area of the proposed converter station and Port Angeles Substation, the city's existing storm drainage system is not currently sized to accommodate future development. In general, groundwater in the project area exists in shallow and deep saturated zones.

S.4.1.2 Environmental Impacts – Proposed Action

Impacts to water quality with all proposed mitigation measures in place would include temporary sedimentation and turbidity in the Strait and Harbor during cable-laying work and HDD hole end point excavation, sedimentation from drilling fluid releases into the Harbor at the HDD hole end point, and potential re-suspension of contaminants in the Harbor around the Rayonier pulp mill outfall. Operation of the cable in the marine environment would increase water temperatures within 4 inches (10 cm) of the sediment surface by less than 1.8°F (1°C). Terrestrial portions of the project would impact water quality through stormwater increases into waterways during dewatering and terrestrial trenching and long-term increases in stormwater run-off from clearing and development of the converter station and at the BPA Port Angeles Substation.

S.4.1.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to water resources.

S.4.2 Vegetation and Wetlands

S.4.2.1 Affected Environment

In Clallam County, there are no federally-listed threatened or endangered plant species, nine state-listed threatened plant species, and a number of special status species. No special status plant species were observed during field surveys of the converter station site and the Port Angeles Substation expansion area in April 2005.

Dive surveys of the marine vegetation in the Harbor found healthy growth of macroalgae, primarily brown algae growing in the cable corridor from about the HDD hole site to depths of 65 feet (20 m). Beyond this point and out to the U.S./Canadian border, attached marine vegetation would not be encountered because water depths are greater than 100 feet (30 m), exceeding 500 feet (150 m) in some places.

Port Angeles is located within the Puget Sound Douglas fir vegetative zone with a native plant community characterized by coniferous forests, usually Douglas fir-dominated, in low to mid-elevations on the west side of the Cascade Range and Sitka spruce and western hemlock subzones.

The HDD hole construction site, the terrestrial DC cable, and much of the AC cable and fiber cable would be in paved areas with no vegetation. Any staging areas required beyond the converter station site and the Port Angeles Substation expansion area would be in paved or graveled areas without vegetation.

The 5-acre (2-ha) converter station property has a mix of vegetation. A little over a third of the site was cleared of trees and vegetation in 2004 and is now a field dominated by white clover and various grasses. A portion of the site has shrubs (willow, snowberry, and salal) and young trees (red alder and Douglas fir trees about 20 feet [6 m] tall) that are maintained to keep from growing into overhead transmission lines that cross the property. The west side of the property consists of relatively mature trees (Douglas fir, western red cedar, red alder, big leaf maple, western hemlock, and Indian plum, with the taller trees reaching 70 to 100 feet [21 to 30 m] tall) and understory vegetation. Another tree buffer is on the east side, just outside the property boundary next to S. Liberty Street. Scotch broom, a Class B noxious weed in Clallam County, is prevalent along the northern property boundary

Most of the area where the Port Angeles Substation electrical yard would be expanded is open area covered in shrubs, legumes, and grasses, with a few small trees. The east of the expansion area is wooded with Douglas-fir, western hemlock, western red cedar and various hardwoods with tree heights reaching 77 to 106 feet (23 to 97 m) tall and an understory of shrubs. This wooded area blends with wooded acreage of the adjacent college property.

On the west side, along Porter Street, the treed area is a mix of primarily younger hardwoods (red alder, bitter cherry, willow, big leaf maple, Indian plum, and Pacific ninebark) and a few larger and older trees (maple, cottonwood, Douglas fir, and western red cedar). The under growth includes ferns, snowberry, and salmonberry.

Riparian Vegetation and Wetlands

Peabody Creek, White Creek, and Ennis Creek are within the project vicinity and have varying amounts of riparian vegetation. However, the creeks are far enough from where the project action would occur that the riparian vegetation would not be affected.

There are no wetlands identified on the converter station site. No wetland indicator-type vegetation is present in the open area, and it is not expected that the soil type, plants, or hydrology are present in the disturbed area under the transmission lines or in the wooded portion of the site. Some wet areas were found during a survey on the BPA Port Angeles Substation expansion area. These areas appear to have generally been caused by tire ruts, seasonal runoff, and water collection in low spots. These areas did not meet at least one of the wetland criteria for soil-type, plant-type, or hydrology and thus are not considered wetlands.

S.4.2.2 Environmental Impacts – Proposed Action

At depths shallower than 100 feet (30 m), the proposed marine cable would affect marine vegetation. Marine trenching and work around the HDD hole end point in the Harbor would remove about 5 acres (2 ha) of marine vegetation, primarily brown algae. Marine algae would recolonize provided that appropriate attachment substrate is available and would recover within one or two growing seasons (Newell et al., 1998).

The HDD hole construction, the terrestrial DC cable, and much of the terrestrial AC cable would be located in pavement and through soil and bedrock and would not impact vegetation, including landscaping or yards of adjacent residents.

To construct the converter station and associated facilities, an approximate 3.75-acre (1.5-ha) portion of the property would be cleared of vegetation. A vegetative buffer about 100 feet (30 m) wide would be left along the west side; however, select tall trees growing within this buffer area that would have the potential of falling into the converter station yard would be removed. Although this site is relatively isolated, and provides a small vegetated space in a fairly developed area, the amount of vegetation that would be removed would be small, and the vegetation is low-to-moderate quality and not unique to the area. Because no wetlands indicators have been found on the converter station site, wetlands are not expected to be affected.

The portion of the terrestrial AC cable and fiber optic cable proposed within paved areas would not impact vegetation. Both routing Options A and B for bringing the cable onto the BPA substation property would require the removal of vegetation, including some tall trees.

Vegetation removed for the interconnection work at the Port Angeles Substation would include about 3.5 acres (1.4 ha) of trees (1 acre [0.4 ha] on the east side and about 2.4 acres [1 ha] on the west side) and 2 acres (0.8 ha) of grasses and shrubs. The trees removed are isolated from other vegetated spaces, and not unique to the area. Because no wetlands are present on BPA property, no wetlands would be impacted.

S.4.2.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to marine or terrestrial vegetation.

S.4.3 Marine Habitat and Wildlife

S.4.3.1 Affected Environment

The shallow banks and deep basins in the central Strait of Juan de Fuca provide habitat for both deep- and shallow-water species (Palsson et al. 2002). A variety of marine habitat can be found along the cable corridor including open water and benthic habitat (kelp beds, eelgrass beds, rock, sand, and mud) (City of Port Angeles 1989). Thirteen ESA-listed wildlife species with known occurrences in the marine environment of Clallam County have been identified. Various marine mammals occupy the trans-boundary waters of the Strait. The Steller sea lion, killer whale, and humpback whale are listed under the Endangered Species Act (ESA).

Shorebirds are common along and in the Harbor and the Strait and its harbors support many fish groups including groundfish, rockfish, forage fish, and many other varieties of finfish. Port Angeles Harbor is an important sport fisheries area. Ediz Hook sport fisheries have included salmon, ling cod, Pacific halibut, rockfish, and greenling (City of Port Angeles 1989).

The coasts of Clallam County support various Pacific salmon groups including Chinook, chum, sockeye, pink, coho, steelhead, and cutthroat trout. Three salmon stocks in Clallam County are listed as threatened under the ESA: the Puget Sound Evolutionarily Significant Unit (ESU) Chinook salmon; the Hood Canal summer-run ESU chum salmon (NOAA 2005b); and the Coastal-Puget Sound bull trout.

Shellfish, including bivalves, crustaceans, and sea urchins, are an important commercial and ecological component of the Strait system. Many types of bivalves (e.g., clams, mussels, oysters) are found along beaches and flats of the Washington coast, including Clallam County. The geoduck, a large edible clam, is of particular commercial and tribal subsistence importance. The geoduck lives in the sandy mud of the lower intertidal and subtidal zones.

Ecologically and economically important, crustacean resources for Port Angeles include Dungeness crab, spot shrimp, and coonstripe shrimp (Shaffer 2001). Purple, red, and green urchins have an abundant and patchy distribution in the Strait (Shaffer 2001).

S.4.3.2 Environmental Impacts – Proposed Action

Potential impacts to marine habitat and wildlife would occur only from the construction of the portions of the proposed project that would be localized in the marine environments, i.e., the marine DC cable and the HDD hole end point.

Of the 13 ESA threatened and endangered marine species that could occur within the project area, five would not be affected by the project. Eight species may be affected, but are not likely to be adversely affected. A biological assessment will be submitted to both the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Fish and Wildlife Service (USFWS).

The cable laying vessel, trenching equipment, and HDD containment area excavation would have direct contact impacts to marine benthic species within about 38 to 46 acres (15 to 19 ha), incidental contact with fish, and unlikely contact with marine mammals. Turbidity would impact benthic or slow moving species and to a lesser extent fish and marine mammals, and in the event of an accidental oil or fuel spill, marine species, especially sea birds, could be impacted

Work within the Harbor would resuspend low-level contaminated sediments that could possibly contribute to biomagnification of contaminants in species within the food chain. Habitat impacts would include the removal of about 5 acres (2 ha) of algae/kelp habitat (with expected re-vegetation within 1 or 2 growing seasons) and about 7 to 14 acres (3 to 6 ha) of benthic and sediment habitat changes due to increased sediment temperatures.

Underwater noise levels from ship and equipment could impact fish and mammals (avoidance of work vicinity, possible disruption of communications, migration, and feeding behaviors), and potentially disrupt the behaviors of benthic species, including filter feeding and foraging. Noise levels near the trenching activities would be considered harassment to marine mammals and fish by the National Marine Fisheries Services (NMFS). In addition, ship presence, noise, and vessel wakes could temporarily disturb sea birds, including bird colony areas in the Harbor area.

The artificial light used at night on the cable-laying vessel could potentially disrupt behaviors of fish and marine mammals attracted to the light.

S.4.3.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to marine species.

S.4.4 Terrestrial Wildlife and Freshwater Fish

S.4.4.1 Affected Environment

The terrestrial portion of the project is located within the City of Port Angeles and most of the terrestrial cable route follows paved roadways, which provides minimal wildlife habitat.

However, some wildlife habitat is nearby, including the harbor shoreline and shoreline bluffs, forested areas, and three creeks (Ennis Creek, White Creek, and Peabody Creek).

Common wildlife species that may occur along the shoreline bluffs include deer, raccoons, opossum, gray squirrels, burrowing rodents, song birds, waterfowl, and shorebirds.

The proposed 5-acre (2-ha) converter station property is a mix of habitat including an open lot seeded with grass, a shrubby area underneath the transmission lines, and an area of coniferous forest along the western edge and to a lesser extent, the eastern edge. This site likely provides habitat for smaller species of mammals (such as squirrels, raccoons, and burrowing rodents), as well as birds. However, the site likely does not support larger species such as deer or species requiring large areas of undisturbed habitat.

The Port Angeles Substation interconnection expansion area lies beneath existing transmission lines, and the habitat consists of shrubs, legumes, grasses, and exposed soil. A mixed stand of conifers and deciduous trees borders both the east and west sides of the BPA property adjacent to the expansion area and provides habitat for small mammals and birds. The forested area on the east side of the property abuts a contiguous block of relatively undeveloped and forested habitat to the south and east that provides connectivity to the White Creek and Ennis Creek riparian corridors.

Anadromous fish are present within Ennis Creek, including coho salmon, bull trout, and winter steelhead. Cutthroat trout are the resident species present within Ennis Creek and White Creek. Anadromous fish within White Creek only include coho salmon. Peabody Creek has poor water quality, but provides habitat to cutthroat trout.

Special-status terrestrial species that have been identified within the project area include the bald eagle and northern spotted owl, coho salmon, bull trout, and Puget Sound steelhead.

S.4.4.2 Environmental Impacts – Proposed Action

Wildlife species found in the terrestrial environment could be impacted by the project through noise disturbance during construction and through habitat alteration. HDD drilling, equipment, and blasting would cause noise and visual disturbance to birds (including possible low-level impacts to foraging eagles) and small terrestrial mammals in the vicinity of project construction. Habitat removed for the project would about 4.5 acres (1.8 ha) of forested habitat and 5 acres (2 ha) of grass/shrub habitat; the habitat is generally disturbed and of low quality.

Freshwater fish species could potentially be impacted by the release of drilling fluids in the event of a fracture during horizontal directional drilling and by increases in stormwater run-off into nearby streams.

S.4.4.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to terrestrial wildlife or freshwater fish species.

S.4.5 Geology and Soils

S.4.5.1 Affected Environment

The project area has been shaped by the tectonic movement of continental plates, glaciers, and human activity. The area is within the active region of the Cascadia subduction zone, where the North American Plate is overriding the Juan de Fuca Plate. Much of the current landscape was also scoured and sculpted by glaciers during the Pleistocene epoch (1.8 million to 10,000 years ago). The glaciers left behind sediments and the deep channels, submarine ridges, basins, and bays that comprise the many waterways of the region. Since the time of the glaciers, some sediments have eroded, and have been redeposited and compacted.

Human activities have also changed the landscape, including excavation in some areas and the use of fill in other areas. Four soil types are present within the project area (USDA SCS 1987); none are agricultural or prime farmland soils. Soils are generally deep, and well-drained. Erosion potential is slight.

When the glaciers retreated after forming the Strait, deposits of glacial tills, glaciomarine deposits, and outwash up to 3,600 feet (1,100 m) thick were left behind (Archipelago 2005). Modern sediments, mostly muds, sand, and coarser-grained materials, including cobbles and boulders also accumulate in the Strait, mainly in isolated basins. Recent sediments also include some pollutants.

Geologic hazards in the area include faults and earthquakes, liquefaction, tsunamis, slope failures and sea floor mobility, and erosion.

S.4.5.2 Environmental Impacts – Proposed Action

In the marine environment about 22,000 to 145,000 $yards^3$ (17,000 to 111,000 m^3) of sea floor sediment would be disturbed in the Strait and about 43,000 $yards^3$ (33,000 m^3) in the Harbor. About 10 to 20 percent of the disturbed sediment would disperse up to about 0.5 mile (0.8 km) from its original place on the sea floor. The disturbed low-level contaminants in the Harbor would stay in the contaminated area, disperse to another contaminated area, or disperse to an unpolluted area.

Sand waves could increase sediment depth over the buried cable or erode sediment resulting in a thinning or removal of sediment cover over the cable. In the event of a severe earthquake, the cable could potentially be severed, at which time the power would automatically shut off.

Drilling muds (bentonite) would be released into the Harbor as the HDD drill bit would exit through the seafloor. Though drilling mud would be removed to the extent possible, some drilling mud would inevitably remain and become part of the sediment make-up.

Construction of the terrestrial cables, converter station, and interconnection at BPA's substation would impact soil through, disturbance, removal, exposure to run-off, compaction, and covering with buildings or rock.

Of the terrestrial soils disturbed, about 215 $yards^3$ (165 m^3) of drill cuttings from the HDD hole would be removed, up to about 1000 $yards^3$ (765 m^3) of soil would be removed from the converter station site, and about 20,000 $yards^3$ (15,000 m^3) of soil would be excavated at the Port Angeles Substation and used on site for terracing. Soils removed would be taken to a suitable landfill or spoil disposal location.

S.4.5.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to earth resources.

S.4.6 Land Use

S.4.6.1 Affected Environment

The marine portion of the proposed project (within the U.S.) is in the jurisdiction of Clallam County, and ownership of the tidal and seabed lands is held by Washington's Department of Natural Resources. The waters in the Strait, above where the proposed marine cable would be trenched, are used by both commercial and pleasure craft.

The land portion of the proposed project is in the jurisdiction of the City of Port Angeles and has various zonings classifications. Land potentially affected by the project is owned by the City, Clallam County PUD, private landowners, and the state and federal government. The converter station site and the BPA substation property are zoned for Public Buildings and Parks. Land uses include industrial, commercial, residential, recreational, transportation and utility purposes. Some land is protected as environmentally sensitive.

S.4.6.2 Environmental Impacts – Proposed Action

Residents and businesses would be temporarily impacted by noise, dust, road closures, and air emissions from construction activities, especially in the vicinity of the HDD hole construction site. Local transportation patterns would be changed to avoid construction. The converter station site would be changed permanently to an industrial setting with restricted access for casual recreation. The Port Angeles Substation expansion would also change the existing casual recreation use, reduce access, and increase the industrial element in the local neighborhood.

S.4.6.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to land use.

S.4.7 Visual Resources

S.4.7.1 Affected Environment

The Port Angeles area has a wide range of features that contribute to its setting including the Olympic Mountains rising to the south, the Strait and open shoreline, wooded drainages, gentle rolling foothills, the waterfront trail, and a busy commercial harbor. Access to marine and alpine environments makes the area a destination for many tourists.

The proposed project route is through marine, industrial, residential, and commercial areas of Port Angeles. In the immediate area of the project, views range from background views of the ocean and mountains, to moderate views of patches of urban trees, the ocean, and residential and commercial areas, to foreground views of utility, transportation and business corridors and residential homes.

The proposed project would cross U.S. Highway 101, which carries large amounts of traffic generally moving quickly through this area going to other locations.

S.4.7.2 Environmental Impacts – Proposed Action

The proposed project would create short-term and long-term visual impacts. Construction activities and staging areas would temporarily change the views of sensitive and other viewers. Permanent buildings and equipment would create long-term impacts as they change views and create contrasts with existing buildings and landscape.

Residents, businesses, and motorists, and recreationists along the waterfront trail would have views of the construction activities in the Harbor and on land. The converter station parcel would be changed permanently to an industrial setting and residents would have screened views of the station through landscaping. The Port Angeles Substation interconnection would also increase the industrial element in the local neighborhood and residents would have increased views of the existing electrical facilities, as well as of the new electrical yard expansion.

S.4.7.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to visual resources.

S.4.8 Socioeconomics

S.4.8.1 Affected Environment

The City of Port Angeles is the county seat of Clallam County with a population estimated for 2004 of 18,530, which accounts for 28.5 percent of the population of Clallam County. According to the City Planning Department, no distinct concentrations of minorities exist in the project area or in the City as a whole (Johns 2006).

The Lower Elwha Klallam Tribe lives in the Lower Elwha River Valley and nearby bluffs on the north coast of the Olympic Peninsula, west of Port Angeles. Elwha tribal members participate in commercial fishing, especially salmon fishing, in the area. The project also crosses the Suquamish Tribe’s Usual and Accustomed fishing areas.

Over 90 percent of the population in Port Angeles is white, and the terrestrial cable corridor passes by both lower and upper-middle class housing.

The City of Port Angeles is in an area known for its rich natural resources, and the industries they support, especially timber and fishing. Recent declines in these industries have had a major effect on the economy of Port Angeles and vicinity. In recent years, though, there has been an increase in service industries related to tourism in the area and an increase in popularity of the Olympic Peninsula as a retirement destination.

S.4.8.2 Environmental Impacts – Proposed Action

Impacts to socioeconomics would include some low-level positive impacts to the economy from construction worker and project supply spending, and short-term increases in population and housing (campgrounds, RV parks, hotels) from about 85 construction workers coming in from outside the area to work on various portions of the project at different points in time. In addition, the project would provide minimal numbers of jobs including temporary non-specialty construction jobs, a full-time security guard job, and the hiring of a local grounds maintenance company for the converter station.

Construction in the Harbor and marine waters would create temporary low-level impacts as fishing and ship traffic would need to avoid the slow moving cable-laying operations. There would be a minimal risk that the cable could be snagged or hit by ship anchors.

S.4.8.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to socioeconomics.

S.4.9 Cultural Resources

S.4.9.1 Affected Environment

The project area has been inhabited for over 11,000 years (Carlson 1990; Matson and Coupland 1995). The Klallam people traditionally lived along the southern shore of the Strait from the Hoko River east to Port Discovery and across the Strait on the southern shore of Vancouver Island. Port Angeles was initially named “Puerto de Nuestra Señora de Los Angelos” by a Spanish naval lieutenant in 1791. By the early 1860s Port Angeles was organized as a town. Logging was an early important economic activity of Port Angeles from its beginning, but the industry began to expand considerably after the area was opened to homesteading in the 1890s, and continued to play an increasingly vital role in the city’s economy until recently.

Documented cultural resources include 12 vessels and two aircraft wrecked in the general vicinity of Port Angeles since 1862, and a precontact and ethnohistoric Klallam village at the mouth of Ennis Creek below the Water Street bluff. The Klallam village had an associated burial ground now under 10 feet (3 m) of fill below the former Rayonier, Inc. parking lot. The mouth of Ennis Creek is also the site of the Puget Cooperative Colony. The Colony buildings were on both sides of Ennis Creek and extended to the base of the Water Street bluff.

Pedestrian and vehicle surveys were conducted along the paved areas of the project (the HDD construction site and the DC and AC terrestrial cable routes). Because the areas are paved, it could not be determined if cultural resources are present. Given the amount of surface disturbance, however, it seems unlikely that wide-ranging intact precontact archaeological materials would be preserved.

A pedestrian survey was also conducted on the converter station site and because of extensive surface disturbance, no shovel probes were done. A pedestrian survey and shovel probes were completed on the BPA Port Angeles Substation property where construction would occur for the interconnection. No evidence of cultural resources was found.

S.4.9.2 Environmental Impacts – Proposed Action

The Proposed Action includes ground-disturbing activities that have the potential to cause direct impacts to cultural resources within the project area. If resources are present, such ground disturbance could destroy the relationships among artifacts and features and their contexts, or could cause the destruction of historic structures or buildings.

S.4.9.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create impacts to cultural resources.

S.4.10 Noise

S.4.10.1 Affected Environment

Noise is regulated in the City of Port Angeles, though construction noise is exempt from regulations between the hours of 7:00 a.m. and 10:00 p.m. Environmental noise is usually measured in decibels on the A-weighted scale (dBA).

Background noise levels were taken at the proposed HDD hole construction site on Liberty Street and at the converter station site. At the HDD hole construction site, the levels were 60 dBA (City of Port Angeles, July 2006). Noise levels during a site visit were observed to be exclusively from passing automobiles. Noise generated from U.S. 101 (Front Street) located 2 blocks (more than 600 feet [183 m]) south of the HDD hole construction site was undetectable.

Sound measurements taken by the City of Port Angeles at the converter station site and adjacent to Lauridsen Boulevard found that ambient background sound ranged from 51 dBA to 53 dBA during daytime hours. Cars traveling by brought the sound levels up to 65-68 dBA, occasionally as high as 70 dBA. However, sound readings also often dropped below 50 dBA indicating that nighttime sound levels would likely be at or below the 45 dBA noise limits for residential areas.

S.4.10.2 Environmental Impacts – Proposed Action

Construction would generate noise. Temporary noise impacts would occur for 2 to 3 days, 24 hours/day from the cable laying ship and equipment work in the Harbor. The HDD hole construction site would generate noise 24 hours per day for 23 consecutive days at levels slightly louder than typical construction noise levels (90 to 95 dBA), reducing to ambient noise levels at a distance of about 600 feet (183 m) from the drilling equipment. Terrestrial construction of the cable trenching, converter station, and interconnection work would generate construction level noise between 7 a.m. and 7 p.m. Required blasting along Liberty Street between 5th and 8th streets would include two blasts per day for 10 days.

Operation of the converter station may raise noise levels in the vicinity of the converter station. Converter stations typically generate noise levels between 35 and 55 dBA.

S.4.10.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create noise impacts.

S.4.11 Health and Safety

S.4.11.1 Affected Environment

Electric and Magnetic Fields

Electric transmission facilities, if not constructed and operated properly, can lead to potential harmful effects. Transmission lines, like all electric devices and equipment, produce electric fields and magnetic fields often referred to as “electromagnetic fields” (EMF). The electrical current is either direct current (DC) or alternating current (AC). The changing direction of AC induces currents in surrounding objects. Since DC does not change direction, it does not induce currents in surrounding stationary objects.

Electrical field strength is measured in kilovolts per meter (kV/m). In a home, the AC electric field strength from wiring and appliances (from 110-volt circuits) is typically less than 0.01 kV/m.

The strength or intensity of magnetic fields is commonly measured in milligauss (mG). The earth’s natural DC magnetic field in the Port Angeles area is about 550 mG. The international guideline for continuous public exposure to DC magnetic fields is 400,000 mG (International Commission on Non-ionizing Radiation Protection, 1994, World Health Organization, 2006).

The AC magnetic field strength in the middle of a typical living room measures about 0.7 mG (California Department of Health Services and the Public Health Institute 2000). Throughout the land portion of the proposed project there are sources of EMF, including appliances, existing AC transmission and distribution lines, and electrical substations.

Toxic and Hazardous Materials

The former Rayonier pulp mill located at 700 North Ennis Street is a contaminated site. The mill property consists of about 80 acres (32 ha), including submerged land in the southeastern portion of Port Angeles Harbor. The pulp mill operated from 1930 to 1997 and used an acid sulfite and bleaching process to produce paper products. Most of the facility has been dismantled since its closure (Integral Consulting and Foster Wheeler 2003).

S.4.11.2 Environmental Impacts – Proposed Action

Electric and Magnetic Fields

High-voltage electric transmission lines, like electrical wiring, can cause serious electric shocks if precautions are not incorporated into their design and construction. The energized electric cables could potentially be exposed and damaged during third-party construction, which could potentially result in an electrical shock to construction workers. Ship anchors could damage the cable, but if the submarine cable insulation was breached by an anchor or by fishing equipment, the cable would automatically disconnect.

Both the DC and AC cables would be in trenches and the electric fields would be shielded by grounding, soil, and water. The DC electric field in the earth directly above the cable would be about 0.004 kilovolts per meter (kV/m), less than the AC levels found in homes. The AC electric field would be about 0.02 kV/m at ground level directly above the AC cable, which is about the same AC electric field found in a typical home. The BPA overhead transmission lines would meet BPA's standard for AC electrical field strength of 9 kV/m maximum on rights-of-way and 5 kV/m at the edge of rights-of-way.

The static magnetic fields from the DC cables at maximum current carrying capacity would be about 550 mG. Depending on the angle between the cable and the naturally-occurring geomagnetic field, the DC cable would add to or subtract from the geomagnetic field. The field levels would decrease with distance from the cable. Animals that depend on magnetism for navigation may be misdirected somewhat while in the combined magnetic field.

Directly over the AC cable (the centerline), the field levels could be between 541 mG and 193 mG, depending on the configuration and spacing. About 15 feet (4.5 m) from the centerline, the levels would drop to between 42 mG and 87 mG. About 30 feet (9 m) from the centerline, the magnetic field levels would drop down to between 12 mG and 33 mG, depending on the configuration and spacing. The closest houses along Porter Street are about 45 to 60 feet (14 to 18 m) from the edge of the road. Nearby residents could have some increased exposure to magnetic fields depending on the cable configuration and placement in the street and the distance from the cable to a residence. For the AC cable routing options onto BPA property, Option A would be routed along Porter Street for about 200 feet (61 m) longer than Option B, though there are no houses along most of this 200-foot (61-m) long stretch.

Magnetic fields at the perimeters of electrical stations tend to be greatest where transmission lines enter or exit the station. The field levels in these areas are the same field levels of those lines.

Several existing overhead power lines would be reconfigured as part of the Proposed Action. If the existing lines at the converter station are moved or reconfigured, the existing magnetic fields would change. If the lines are moved to the west side of the property, the lines would be located at least 100 feet (30 m) from the property boundary. Because field levels reduced rapidly with distance, increased levels would not be expected at the edge of the property. If the lines were moved to the east side of the property, there are no residences on that side and there would be no potential for long-term increase in public exposure.

A BPA overhead transmission line would need to be moved to the west on BPA property to accommodate the interconnection work at the Port Angeles Substation. The existing field levels would change and the line would be closer to the residences on Porter Street, however because the line would, at its closest point, be about 125 feet (38 m) from Porter Street, there would be no increased magnetic field exposure to homes.

Toxic and Hazardous Materials

There is a potential for safety impacts in the event of accidental oil spills or mishandling or storage of toxic or hazardous waste products. Also, fire could potentially occur without appropriate fire protection systems installed in the converter station or if trees were allowed to grow too close to overhead lines or electrical yards.

Although the HDD hole would pass beneath the contaminated area of the former Rayonier pulp mill, contaminants occur in the surface sediments and the proposed depth of the HDD hole would be deep enough that no contaminated soils or sediments would be expected to be encountered during the drilling. The contaminated marine sediments would be disturbed in the Port Angeles Harbor, but samples indicate that the sediments generally do not exceed the State of Washington Sediment Quality Standards (SQS).

S.4.11.3 Environmental Impacts – No Action Alternative

The No Action Alternative would not create health and safety impacts.

S.4.12 Air Quality

S.4.12.1 Affected Environment

The air quality in Port Angeles is consistently ranked as good. Clallam County is not within an EPA-listed non-attainment area or maintenance area for any of the criteria pollutants.

S.4.12.2 Environmental Impacts - Proposed Action

Construction would have low-level impacts on air quality; activities such as terrestrial trenching would create dust (particulate matter) and the heavy equipment required would emit exhaust pollutants.

S.4.12.3 Environmental Consequences - No Action Alternative

The No Action Alternative would not create impacts to air quality.

S.4.13 Cumulative Impacts

“Cumulative impacts” are the impacts on the environment which result from the incremental impact of an action – such as this Proposed Action – when added to other past, present, and reasonably foreseeable future actions.

In general, urbanized uses have been developed along much of the Strait’s shoreline in the project vicinity ranging from single-family residential to large-scale industrial and port uses. Due to continuing population growth and other factors, development is expected to continue into the future.

Reasonably foreseeable development that may occur in the vicinity of the Proposed Action could include expansions at Peninsula College, City of Port Angeles capital projects, removal of the

Elwha and Glines Canyon dams on the Elwha River (which flows from the Olympic Mountains to the Strait near Port Angeles), the potential construction of another transmission cable project (Vancouver Island-Fairmont) proposed by Sea Breeze, and potential improvements to transmission lines along the Olympic Peninsula to allow the proposed cable to operate at its full capacity.

The proposed Port Angeles-Juan de Fuca Transmission Project may contribute incrementally to impacts to a number of resources that have been or are being cumulatively impacted by past, present, and reasonably foreseeable future actions. The resources include those previously discussed including the following: water, vegetation, marine habitat and wildlife, terrestrial wildlife and freshwater fish, soils, land use, visual resources, socioeconomics, cultural resources, noise, health and safety, and air quality. The contribution of the Proposed Action to these cumulative impacts would vary, with the greatest contribution occurring in cumulative impacts on water resources and marine habitat and wildlife.

1.0 Purpose and Need for Agency Action

This chapter describes the purpose and need for the United States (U.S.) Department of Energy (DOE) to take action regarding the proposed Port Angeles–Juan de Fuca Transmission Project. This chapter also presents the project applicant's objectives and a summary of the public scoping process conducted for this environmental impact statement (EIS). The end of the chapter provides information about the scope and organization of this EIS.

1.1 Introduction

Sea Breeze Olympic Converter LP (Sea Breeze) has applied to DOE for authorizations and approvals necessary to construct the U.S. portion of an international electric power transmission cable. Sea Breeze's proposed cable project would extend from the greater Victoria area, British Columbia (B.C.), Canada, to Port Angeles, Clallam County, Washington, U.S. (see Figure 1-1).

The proposed cable project involves the installation of a ±150-kilovolt (kV) direct-current (DC) transmission line cable, which could carry up to 550 megawatts (MW) of power. The total length of the cable would be about 32 miles (52 kilometers [km]). Beginning at the northern end, the proposed cable would connect into the B.C. transmission system, which is owned by B.C. Hydro and Power Authority and operated by the British Columbia Transmission Corporation, both Crown corporations of the Province of British Columbia, Canada. About 7.5 miles (12 km) of cable would be buried underground in Canada, about 23 miles (37 km) of cable would be trenched under the Strait of Juan de Fuca (Strait) international waterway, and about 1.5 miles (2.4 km) of cable would be buried underground through Port Angeles, Washington. In Port Angeles, the cable would connect to the Federal Columbia River Transmission System, which is owned and operated by Bonneville Power Administration (BPA).

About 12.0 miles (19.3 km) of the cable would be located in U.S. jurisdiction; about 10.5 miles (16.9 km) in the ocean and 1.5 miles (2.4 km) on land. This portion of the cable project is referred to as the "Port Angeles-Juan de Fuca Transmission Project" and is the subject of this EIS.

Sea Breeze would construct and own the proposed cable project. Sea Breeze intends to sell capacity on the cable to interested utilities or generators (through open access), with power flow possible both north and south between the U.S. and Canada. Because the proposed project does not include improvements that would increase the capacity of BPA's transmission system, power flow to and from the proposed interconnection with BPA's system would be subject to existing power transfer limits and transmission constraints. Power flow in excess of the existing capacity on BPA's transmission system would require improvements to the system. A complete description of the Port Angeles-Juan de Fuca Transmission Project is provided in Chapter 2 of this EIS.

1.2 Purpose and Need for Action

Sea Breeze has applied to the Office of Electricity Delivery and Energy Reliability (OE), an organizational unit within DOE, for a Presidential permit for its project. Sea Breeze has also submitted a request to BPA, another organizational unit within DOE, for interconnection into the federal transmission system. This section describes the respective purpose and need for action for OE and BPA.

1.2.1 Office of Electricity Delivery and Energy Reliability

Executive Order (E.O.) 10485 (September 9, 1953), as amended by E.O. 12038 (February 3, 1978), requires that a Presidential permit be issued by DOE/OE before electric transmission facilities may be constructed, operated, maintained, or connected at the U.S. international border. On December 20, 2004, Sea Breeze filed an application with the Office of Fossil Energy[1] of DOE for a Presidential permit for the construction of a 150-kV electric transmission line that would cross the U.S.-Canadian border. DOE published a "Notice of Application" in the Federal Register on February 18, 2005 (70 FR 8350). A copy of the application may be accessed at http://fossil.energy.gov/programs/electricityregulation/pdf/299_ap.pdf.

The purpose and need for DOE/OE's action is to respond to Sea Breeze's request for a Presidential permit. DOE/OE may issue or amend a Presidential permit if it determines that the action is in the public interest and after obtaining favorable recommendations from the U.S. Departments of State and Defense. In determining whether issuance of a permit is in the public interest, DOE/OE considers the environmental impacts of the proposed project pursuant to the National Environmental Policy Act, the project's impact on electric reliability, and any other factors that DOE/OE may consider relevant. If DOE/OE determines that issuing the Presidential permit would be in the public interest, the information contained in this EIS will provide the basis for DOE/OE to decide which alternative(s) to authorize and which mitigation measures, if any, would be appropriate for inclusion as conditions of the permit. A decision, in the form of a Record of Decision, will be issued no sooner than 30 days after the U.S. Environmental Protection Agency's publication of a "Notice of Availability of the Final EIS" in the Federal Register. The Presidential permit, if approved, would be issued simultaneous with, or subsequent to, the Record of Decision.

Sea Breeze does not intend to use its proposed international transmission facilities to export electric energy from the U.S. on its own account; therefore, Sea Breeze does not need to obtain export authority from DOE/OE. However, any third party proposing to export electric energy

[1] The Permitting and Siting staff that issues Presidential permits is now located within the Office of Electricity Delivery and Energy Reliability (OE-20) of the Department of Energy.

from the U.S. to Canada using Sea Breeze's proposed cable project must first obtain an electricity export authorization from DOE/OE pursuant to section 202(e) of the Federal Power Act. DOE/OE may authorize electricity exports to a foreign country if it determines that the proposed export would not impair the sufficiency of electric power within the U.S. and that it would not impede, or tend to impede, the coordination in the public interest of regional transmission facilities. DOE/OE also must comply with NEPA prior to authorizing electricity exports. This EIS does not address the impacts associated with exports over Sea Breeze's proposed international facilities. The environmental impacts associated with electricity exports will be addressed individually for each export proceeding at the time of application.

1.2.2 Bonneville Power Administration

BPA owns and operates the federal transmission system in the Pacific Northwest. The transmission system consists of more than 15,000 circuit miles of high-voltage (115-kV and above) transmission lines, including most of the high-voltage lines in the Pacific Northwest. These transmission lines move most of the Northwest’s power from generating facilities to power users throughout the Northwest and nearby regions (e.g., north to Canada and south to California and Arizona).

BPA needs to respond to Sea Breeze’s request to connect to the transmission system. BPA has adopted an Open Access Transmission Tariff, which is generally consistent with the Federal Energy Regulatory Commission’s *pro forma* open access tariff. Under BPA’s tariff, procedures provide for new interconnections to the transmission system to all eligible customers, consistent with all BPA requirements and subject to an environmental review under NEPA.

In making a decision concerning Sea Breeze’s request to interconnect, BPA will consider the following purposes or objectives.

- Maintenance of transmission system reliability. *The interconnection must not compromise the transmission system. As part of the interconnection request, BPA has prepared facility and system studies to determine how the transmission system would respond, to forecast the conditions that would limit uses of the interconnection, and to identify what improvements would be required on the system to allow reliable interconnection.*
- Consistency with BPA’s environmental and social responsibilities. *Through this EIS process and other laws and regulations, the potential environmental impacts of the proposed project will be identified, public comments will be obtained, and mitigation measures will be determined.*
- Cost efficiencies. *BPA would need to protect against incurring stranded costs through the use of agreements and pay schedules with Sea Breeze for costs associated with the project, and by ensuring creditworthiness of the developers.*

1.3 Sea Breeze's Project Objectives

Sea Breeze's stated objectives for the proposed 550-MW cable include the following: relieving transmission constraints, improving power exports between Canada and the U.S., and improving transmission system reliability. (For more information see Appendix A.)

1.4 Public Involvement

Early in the development of this EIS, DOE solicited input from the public, agencies, and others to help determine what issues should be studied in the EIS. Because these issues help define the scope of the EIS, this process is called "scoping."

DOE requested comments through the following means:

- DOE published a Notice of Application for a Presidential permit for the proposed project in the Federal Register on February 18, 2005 (70 FR 8350).
- DOE published a Notice of Intent to prepare an EIS and conduct a public scoping meeting for the project in the Federal Register on April 28, 2005 (70 FR 23855).
- On May 4, 2005, DOE sent a letter requesting comments and inviting the public to a scoping meeting to about 415 people or agencies. This letter was sent to people who live along the proposed buried transmission cable route in Port Angeles; federal, state, and local agencies that may have expertise or require permits for the project; Indian tribes with interest in the area; and other interest groups.
- DOE held a public open-house style scoping meeting on May 24, 2005 at Peninsula College in Port Angeles, Washington.
- Two meetings with state and federal regulatory agencies were held – one at the Seattle District Corps of Engineers office on May 18, 2005, and another at the Department of Ecology offices in Olympia, Washington on June 29, 2005.
- BPA established a project web site with information about the project and the EIS process (available at http://www.transmission.bpa.gov/PlanProj/Transmission_Projects/).

Thirty-two people came to the May 24, 2005 public open-house scoping meeting and made 61 comments. Fourteen people sent written comments (letters, e-mails, and a completed comment form) that added 170 comments. Most of the scoping comments received by DOE focused on three areas:

- The need for and scope of the project (how would the power sent across the cable be generated, where would the power be sold, and how would the transmission lines on the Olympic Peninsula be impacted [see also Section 1.5]);
- Project details (questions about design, route location, depth of burial beneath Port Angeles city streets, etc.); and

- Potential impacts on biological resources (especially impacts on marine mammals, fish, and habitat of the Strait).

Commentors were also concerned about the potential impacts on water resources, geology and soils, land uses, cultural resources, and health and safety (mostly questions regarding electric and magnetic fields).

All comments and questions received by DOE during the 30-day scoping period were documented, characterized by subject, and provided to the appropriate EIS resource specialist to include in the environmental impact analyses in this EIS.

Please see Appendix B for public involvement mailings and a list of scoping comments.

1.5 Issues Outside the Scope of the Proposed Action or this EIS

Though most of the issues raised during scoping or in early planning are considered to be within the scope of the Proposed Action and are addressed in this EIS, some issues are considered to be either beyond the scope of this EIS (and thus not addressed in this EIS) or are outside the scope of the Proposed Action. The following describes these issues.

Impacts in Canada – One commentor asked how the environmental impacts outside the U.S. borders would be addressed. The analysis in this EIS focuses on the impacts within U.S. borders and impacts that could affect the U.S. This approach is consistent with Executive Order 12114 (January 4, 1979), which provides direction to federal agencies concerning when analyses of environmental impacts outside U.S. borders is appropriate. The E.O. does not require federal agencies to evaluate impacts outside the U.S. when the foreign nation is participating with the U.S. or is otherwise involved in the action [Section 2-3(b)]. In this case, the Canadian Government, through the National Energy Board, authorized the Canadian portion of the proposed project and required an environmental review[2] as part of its process. Impacts outside U.S. borders thus are not addressed in this EIS.

Olympic Peninsula Transmission Line Improvements – Another commentor stated that it is important to study whether building the proposed project would lead to increased loads on the Olympia-Port Angeles transmission corridor, and if increased loads would require upgrades to the system. The commentor also stated that upgrades to the Olympia-Port Angeles corridor would have environmental consequences.

As part of the request to connect into BPA's transmission system, BPA conducted a study to analyze the impacts of the proposed project on the system and to identify system improvements

[2] The environmental analysis and documents related to National Energy Board's approval of Sea Breeze's proposed project are available at https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=428575&objAction=browse

that may be required to allow interconnection and power flow. This analysis, the Olympic Converter, LP Transmission Interconnection System Impact Study[3], examined the BPA system from BPA's Port Angeles Substation to BPA's Olympia Substation. The study showed that it is operationally feasible to interconnect the proposed cable to the BPA transmission system without making system improvements to increase the capacity of the system. However, under such an interconnection, power flow to and from the proposed cable would be subject to existing power transfer limits and transmission constraints. For example, limited power from or to the new interconnection could flow through the BPA transmission system on the Olympic Peninsula at certain times of the day and at certain times of the year when the existing lines are being used at less than full capability.

The study also showed that if, at some point in the future, it is proposed that transmission constraints on the Olympic Peninsula system be removed to allow for the full 550-MW flow of power to and from the proposed interconnection at any time of the day or in any season (i.e., firm power), upgrading or replacement of some existing lines, as well as the addition of new lines, would be required.

As is discussed further in Chapter 2 of this EIS, Sea Breeze has proposed that its project be connected to BPA's transmission system without any improvements to increase the capacity of this system. Sea Breeze believes that such an interconnection is both financially and operationally feasible, and they will accept restrictions on transmitting power across the system to maintain reliability. Accordingly, construction of system improvements is not proposed as part of this project.

Although not part of the proposed project, the potential system improvements identified in the system impact study are discussed and considered as a potential future project in the cumulative analysis in this EIS (see Cumulative Impacts Analysis, Section 3.13). However, the nature and extent of potential system improvements remain uncertain. Without a request for transmission service to send power from one point to another within the BPA system, it is impossible to determine the complete number of transmission system improvements that would be needed. As generators or utilities propose to purchase capacity on the proposed cable and make requests to BPA to transmit power across the BPA transmission system, BPA will study the system to determine all necessary transmission system improvements. At that time, BPA would prepare appropriate NEPA documentation to evaluate potential impacts of any proposed system improvements and seek public comments.

Interconnection at BPA's Fairmount Substation – Sea Breeze also has proposed another 550-MW, ±150-kV cable from Vancouver, B.C. to BPA's Fairmount Substation on the Olympic Peninsula. This proposed cable would be a separate project, neither dependent on nor an alternative to the interconnection at Port Angeles. Sea Breeze has not proceeded with a Presidential permit for this proposed project, but has submitted a request to BPA for interconnection for this project (see Cumulative Impacts Analysis, Section 3.13).

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[3] Available on request at http://www.transmission.bpa.gov/PlanProj/netplanning.cfm.

Alternative Electric Power Sources – During scoping, a commentor requested that DOE consider alternative electric power sources. As stated earlier, the need for the two DOE entities, OE and BPA, to take action is to respond to an application for a Presidential permit and to a request for interconnection. Therefore, the alternatives being considered are alternatives to the need for action (whether to grant a Presidential permit and whether to allow the project to interconnect), not alternative power sources. Also, Sea Breeze has stated that it will sell the capacity on the cable to willing generators selling power. At this point, who those generators may be, how they may generate the power, or where they would send the power for purchase is unknown. Therefore, consideration of alternative electric power sources is beyond the scope of this EIS.

1.6 Organization of the Environmental Impact Statement

The remainder of this EIS is organized as follows:

- Chapter 2 describes the Proposed Action, the No Action Alternative, and alternatives considered but eliminated from detailed consideration. It summarizes the differences between the Proposed Action and the No Action Alternative, especially in potential environmental impacts.
- Chapter 3 describes the existing environment that could be affected by the project and the possible environmental consequences of the Proposed Action and No Action Alternative. An assessment of the direct, indirect, and cumulative effects on water resources, vegetation and wetlands, marine habitat and wildlife, terrestrial wildlife and freshwater fish, geology and soils, land use, visual resources, socioeconomics, cultural resources, noise, health and safety, and air quality, is provided. Impacts can range from no or low impact to high impact.
- Chapter 4 discusses the licenses, permits and other approvals that must be obtained to implement the Proposed Action.
- Chapters 5 through 8 list the individuals who helped prepare the EIS, the references used, the individuals, agencies, and groups that were notified of the availability of the EIS, and provides a glossary.
- An index is included as Chapter 9.
- Supporting technical information is in appendices.

2.0 Proposed Action and Alternatives

This chapter describes the Proposed Action, the No Action Alternative, and alternatives that were considered but eliminated from detailed study.

2.1 Proposed Action

DOE/OE's Proposed Action would be to grant Sea Breeze a Presidential permit for the international border crossing of the proposed cable. BPA's Proposed Action would be to allow the proposed cable to connect into the federal transmission system at BPA's Port Angeles Substation. The interconnection would allow power flow over BPA's system to the extent that capacity on the system is available.

With federal approvals granted, Sea Breeze could construct the portion of its proposed cable project that would be located in the U.S., i.e., the Port Angeles-Juan de Fuca Transmission Project. The proposed DC transmission cable would be about 32 miles (52 km) long starting from a new converter station in Victoria, B.C., Canada, and terminating at BPA's existing Port Angeles Substation in Port Angeles, Washington (see Figure 1-1). The cable would cross both land and sea under Canadian and U.S. jurisdictions. The proposed project evaluated in this EIS is the portion of the cable (about 12.0 miles [19.3 km]) that would be located in U.S. jurisdiction (see Section 1.5). The proposed project is shown in Figure 2-1.

The main components of Sea Breeze's project (from north to south) are listed below and described in detail in subsequent sections.

- Marine Direct Current Transmission Cable. A marine DC cable would cross the Strait of Juan de Fuca.
- Horizontal Directional Drill (HDD) Hole for the DC Cable. This type of underground installation is proposed to transition the DC cable from the sea bed to land.
- Terrestrial Direct Current Transmission Cable. A DC cable would be buried underground from the HDD hole site through Port Angeles city streets to a new converter station.
- Converter Station. A converter station would be built to convert the power from DC to alternating current (AC), so that the power can be connected to the federal transmission system (see box).
- Terrestrial Alternating Current Cable. This buried cable would connect the converter station to BPA's Port Angeles Substation.

- Port Angeles Substation Interconnection. BPA would expand its existing substation and add new equipment to connect the power from the Sea Breeze project to the federal transmission system.

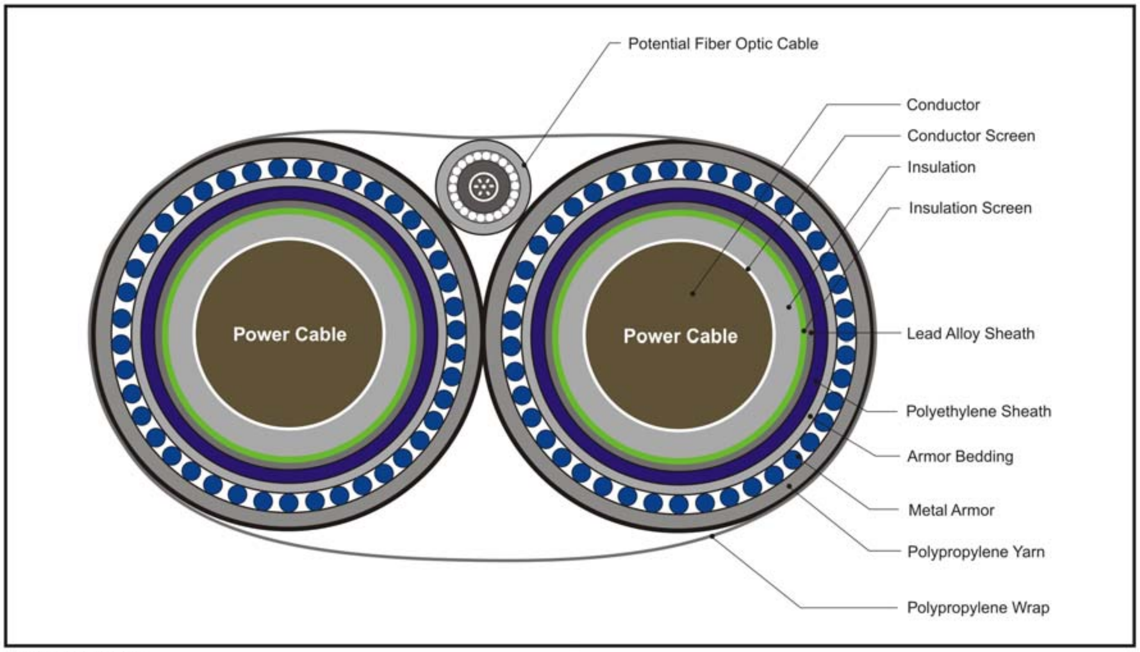
> **Direct and Alternating Current**
>
> Electrical systems operate via direct current (DC) or alternating current (AC). DC is constant over time, while AC varies, or cycles, over time in both magnitude and polarity. The frequency of these AC cycles is expressed in Hertz (Hz), which is the number of cycles per second (i.e., 1 Hz is equal to one cycle per second). Typically in North America, AC systems operate at 60 Hz. Battery-operated devices and tools, including flashlights, cordless drills, automobiles, golf carts, tractors, etc., use DC. Direct current also is sometimes used in transmission lines to move electricity over long distances, but it requires converter stations at each end to convert AC to DC and back again from DC to AC prior to being connected to a local distribution system.
>
> Although costs for converter stations can be high, DC can be justified and cost effective when considering power system control benefits and transmission line loss savings, especially with underground/underwater cables.

2.1.1 Marine DC Transmission Cable

Of the 32-mile (52 km) transmission cable, about 10.5 miles (17 km) would be in the marine environment under U.S. jurisdiction.

The marine transmission cable would be a ±150-kV DC cable that would be manufactured in Europe as a single, continuous, triple-extruded, polymer-insulated cable. The cable would consist of two copper conductors. The conductors would be insulated, strengthened with high tensile strength steel wire, sheathed in thick polypropylene yarn, and bundled together as one cable (see Figure 2-2). The cable would be about 9 inches (22 centimeters [cm]) in diameter and would weigh about 48 pounds per foot (72 kilograms per meter [kg/m]). The cable would not contain fluids or oil-impregnated insulation. Sea Breeze may also co-locate a fiber optics cable with the electric transmission cable for possible future use for communications. (See also Appendix A.)

The mobilization point for installation of the marine cable could be Victoria, B.C., or Port Angeles, Washington. A specialized cable-laying ship would be used to install the marine cable (see Figure 2-3). The marine cable would be transported from Europe to the mobilization point by the cable-laying ship or would be loaded onto another cable-laying vessel at the mobilization point. The cable-laying ship would carry the necessary equipment to install the proposed cable including a frame for deploying the trenching equipment and a control room for operation of the equipment. The cable-laying ship would use lighting during nighttime construction periods for operation and crew safety.



Source: SeaBreeze 2006.

Figure 2-2 Marine DC Cable Cross Section

Figure 2-3 Typical Cable Laying Ship

As described in Section 2.1.1.1, the proposed marine cable would be buried in a trench for most of its length across the Strait. In some areas, the cable may rest on the sea floor if trenching is impossible (see Section 2.1.1.2). Sea Breeze has identified a one-mile (1.6-km) cable corridor across the Strait in which the marine cable would be placed. In the United States, this corridor extends from the U.S.-Canada international boundary at about 48° 15' 6.4829 latitude and

123° 24’ 27.7963 longitude to a point in the Port Angeles Harbor (see Figure 2-1). Sea Breeze identified this corridor based on the most direct path across the Strait that would avoid, to the maximum extent practicable, existing cables or utilities and ferry or shipping routes. Sea Breeze has conducted a bathymetry and surfical geology study of the mile-wide corridor to identify the sea floor terrain including rocky areas, sediment depth, and possible cultural sites. The specific cable alignment within the corridor would be routed to avoid, where possible, features that could potentially make trenching difficult, such as seabed ridges, large sand waves, large rocks, and sunken ships. (See Appendix C for maps of the geology of the sea floor along the corridor.)

The southern end of the proposed marine cable would enter the Port Angeles Harbor about 0.93 mile (1.5 km) to the east of Ediz Hook point (see Figure 2-4). About 1,340 feet (408 m) from shore, where the cable would reach a water depth of about 26 to 30 feet (8 to 9 m), the cable would be pulled through a horizontal-directional-drilled (HDD) hole to transition from the sea floor to land (see Section 2.1.2).

2.1.1.1 Sea Floor Trenching and Cable Laying

Information about sea bed rock and soil conditions in the marine cable corridor indicates that the proposed cable could be buried for much of its length. In these areas, a trench typically 3 to 5 feet (1 to 1.5 m) deep and about 4 feet (1.2 m) wide would be created in which the cable would be laid, with the potential for burial to greater depths if required. Actual trench depth and width would vary depending on sea bed conditions encountered and existing uses that could disturb the cable. For instance, in select areas, such as the Port Angeles Harbor, the cable may need to be buried deeper, up to 12 feet (33.7 m) deep, to help protect the cable from possible damage from ship anchors. In these areas, because of the greater trench depth, the trench width could be up to 16 feet (5 m) wide. In some isolated areas, trenching may not be possible or appropriate (see Section 2.1.1.2).

Sea Breeze would use one or more of three possible methods to trench the cable into the sea floor; using a sea plow, hydro-jetting, or using a hydroplow. All proposed trenching methods would disturb the sea floor and all methods can create similar-sized trenches. Prior to construction, Sea Breeze would confirm sea bed rock and soil conditions in the marine cable corridor to aid in selecting the most appropriate type of equipment to use.

A **sea plow** has a blade (plowshare) that trenches the sea bed, pushing sediment aside as it is pulled by a cable-laying ship. When a sea plow is used, the cable is aligned in the trench as the plow moves forward (see Figure 2-5). The sea plow is controlled by an operator in a ship-board control room who receives information through a fiber cable. The operator can adjust the angle of the plow and depth of the trench.

Hydro-jetting uses a remotely-operated machine that creates a trench and buries the cable. After the cable-laying ship unreels the cable and allows it to settle on the sea floor, the hydro-jetting machine follows the route and uses water to push or “fluidize” the sediment around the cable to create a trench. The soil properties of the sea bed (grain size, density, etc.) determine the amount of material that can be fluidized during jetting. After jetting, the cable falls to the base of the trench, and sediment settles back in to cover the cable and trench. Because of its ability to operate remotely, this method would be used in the Harbor where it becomes too shallow for the ship to be able to pull either the sea plow or hydroplow (see Section 2.1.1.3).

The **hydroplow** is like a sea plow in that it is towed by a ship, but is also like hydro-jetting because it uses pressurized seawater jetted through nozzles to fluidize the sediment in front of it. The force of the water enables the plow to create a trench faster and easier than the sea plow. Water jets produce a downward movement that helps displace sediments within the trench to bury the cable.

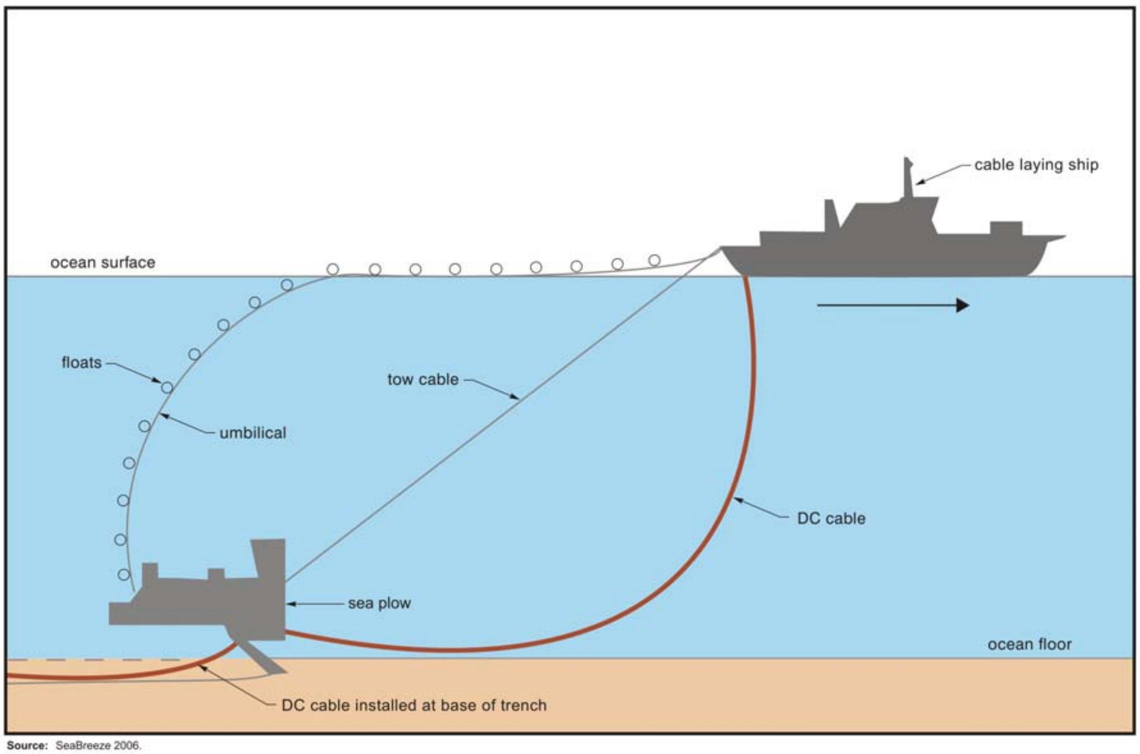


Figure 2-5 Typical Marine Cable Installation Using a Sea Plow

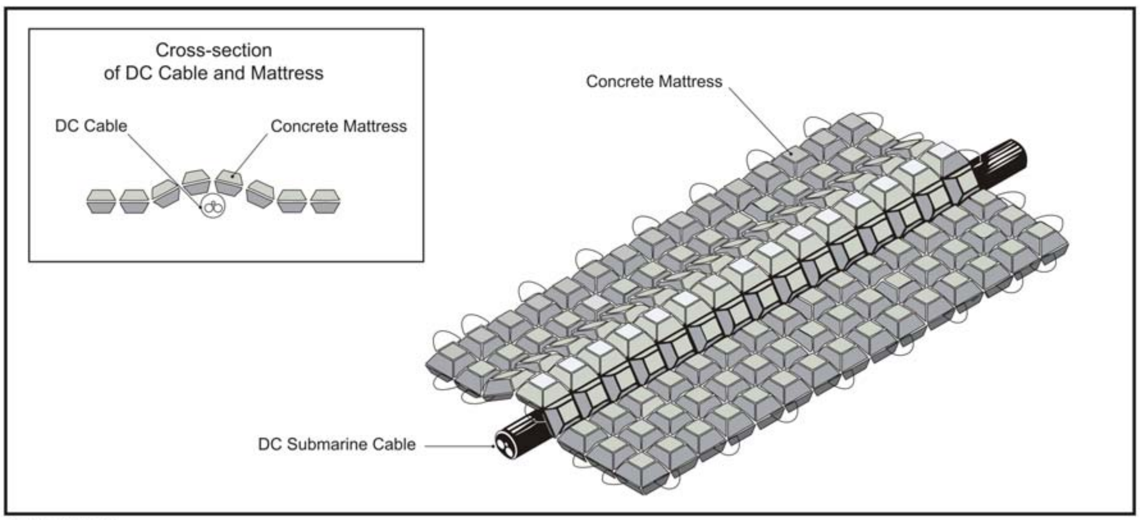
Under all three trenching methods, most of the sea floor sediment disturbed during trenching would be expected to fall back into the trench and bury the cable immediately after the cable is placed in the trench. Based on the expected range of vessel speeds (typically 1-2 knots [1.1 to 2 miles per hour (mph), or 1.9 to 3.7 kilometers per hour (kph)]), the cable-laying process in U.S. waters would take about 2 to 3 weeks. Work would occur 24 hours/day, seven days a week.

2.1.1.2 Cable Protection Without Trenching

In some areas, such as where the sea bed is rocky or already trenched for other utility cables, a new trench cannot be created for the proposed cable. In these areas, the cable would be placed on the sea floor. It is expected that between 100 and to 2,000 feet (30 to 610 m) of the marine cable could be laid on the sea floor without trenching. These areas may be at various points along the route.

If there is a danger that the cable laying on the sea floor could suffer physical damage from anchors or other hazards, the cable would need to be protected. One way to protect the cable would be to place a concrete or grout blanket or mattress over the cable (see Figure 2-6). The mattress would be lowered from a ship, or moved into place by another vessel.

The cable could also be protected by encasing it in a polyethylene sleeve that would protect it from abrasion or placing rock fill over the cable. If the cable crosses other existing trenched utility cables, Sea Breeze would develop agreements with the utilities to determine which method to use to protect the proposed marine cable and the existing cables.



Source: Submar Inc.
Modified by SeaBreeze 2006.

Figure 2-6 Example of a Concrete Mattress

2.1.1.3 Shallow, Near Shore Construction

Near the shoreline, the cable-laying ship may be unable to use the sea plow or hydroplow to lay the cable on the sea floor because ocean depths at this location would be too shallow. In this area, the cable-laying ship would take a position as close to the shore as possible. Then the cable, with floats attached, would be let out by winch onto the surface of the water. The end of the cable would be connected to a small guide wire that would be threaded from the terrestrial end of the proposed HDD hole on North Liberty Street (see Section 2.1.2). After being connected to the guide wire, the cable would be pulled into and through the HDD hole as the floats are removed. Once at the street, the marine cable would be spliced into the terrestrial cable. Then an operator on the cable laying ship would maneuver the remotely operated hydro-jetting machine in this shallow area to create a trench for the cable on the sea floor and bury the cable up to the HDD hole end point in the Harbor.

The work in the Harbor to connect the marine cable to the upland cable would be expected to take about three days, including the hydro-jetting.

2.1.2 Horizontal Directional Drill Hole

The cable would transition from the sea bed to land through a proposed HDD hole, which would be between 13 and 15 inches (33 and 38 cm) in diameter. The hole would extend generally southwest from a point about 1,340 feet (408 m) offshore in the Harbor, under the shoreline and bluff, to a point along North Liberty Street just south of Caroline Street in Port Angeles. Figure 2-7 shows the proposed route for the HDD hole. Figure 2-8 shows a generalized profile of the proposed hole. The ocean water depth where the hole would emerge on the sea floor would be about 26 to 30 feet (8 to 9 m).

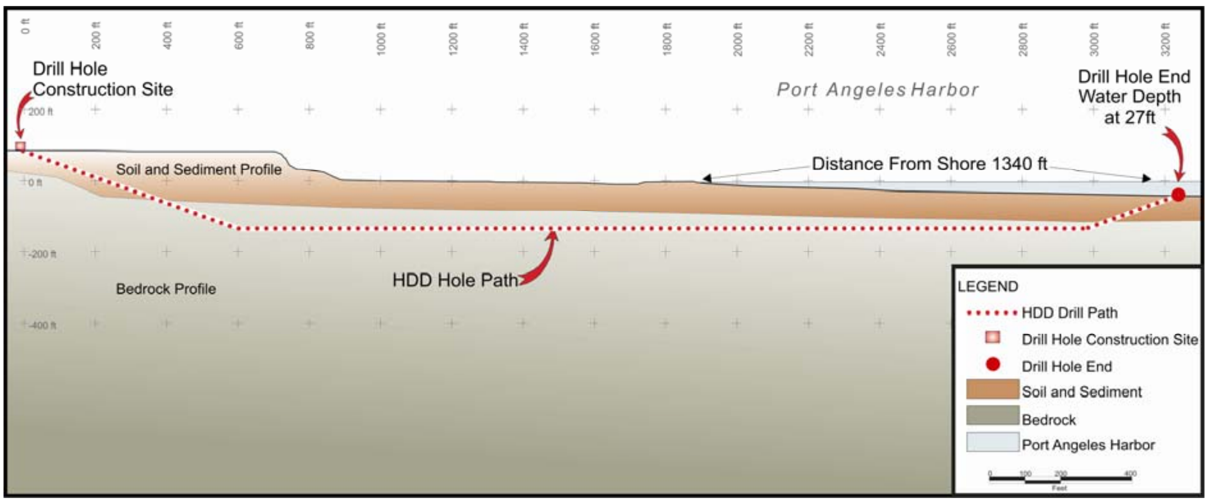


Figure 2-8 Profile of Horizontal Directional Drill Hole

The hole would be bored using an HDD and would be a total of about 3,300 feet (1.0 km) long. Prior to construction, a survey team would determine the exact bore route and develop a plan that establishes precise entrance and exit angles, the cable path curvature to achieve the design depth and length of the bore hole, and the location of any existing utilities to avoid. The City of Port Angeles has a 27-inch (69-cm) diameter sewage outfall pipe that extends into the Port Angeles Harbor and crosses the proposed HDD hole route. At the point where the HDD hole and the outfall pipe cross, the HDD hole would be located about 65 feet (20 m) below the outfall pipe.

All drilling would take place from the land. The proposed location for the drilling operation would be near the intersection of North Liberty Street and Caroline Street (see Figure 2-9). The overall area needed for HDD construction equipment would likely block all of North Liberty Street between Caroline Street and the alleyway that runs between Caroline and Georgiana streets during drilling operations.

Construction would begin by creating a hole in the street about 5 feet wide by 6 feet long by 3 feet (1.5 m by 1.8 m by 0.9 m) deep. About 2 cubic yards (1.5 m^3) of underlying soil would be excavated. A truck-mounted HDD vehicle with power generators, drill pipe and racks, storage tanks for drilling muds, and clean water storage tanks would be brought to the site. Steel plates or other protective material would be placed on the road to protect the surface from heavy equipment and material needed for the drilling operation. The HDD operation would disrupt through-traffic on that section of Liberty Street for the duration of the drilling operation, but access to local residents would be maintained.

The horizontal directional drilling process involves the following steps:

- drilling a pilot hole,
- reaming the pilot hole to enlarge it,
- installing casing pipes, and
- pulling the cable through the drilled hole.

First, the pilot hole would be drilled along the prescribed drill path. The pilot hole would be about 8 inches (20 cm) in diameter. Next, the hole would be reamed out to enlarge the pilot hole to the desired width, which would be between 13 and 15 inches (33 and 38 cm) in diameter. There are two ways to ream out the hole, back reaming and forward reaming. With back reaming, the pilot drill would go to the end of the hole in the Harbor and a reamer would be attached and pulled back though the hole, enlarging the hole as it goes.

With forward reaming, the pilot drill would stop short (65 to 98 feet [20 to 30 m]) of the end of the hole. Then the reamer would start from the beginning of the hole, enlarging it and finishing the hole on out to the end point in the Harbor.

Both the piloting and reaming procedures would require the use of drilling fluids to flush the soil and rock particles from the drill hole, cool the drill bit, seal and support the drilled hole, and lubricate the hole. Drilling fluid or mud would consist of water and bentonite, a non-toxic, naturally-occurring clay. A non-toxic polymer may be added to the drilling mud if additional suspension of the soil and rock particles would be required. The drilling mud would be contained in a mud tank next to the borehole. Soil and rock particles would drop to the bottom of the tank and the “clean” drilling mud from the top of the tank would be recirculated back into the borehole.

During the drilling operation, soil cuttings from the mud recycler and residual drilling fluids would be removed either by vacuum or tandem trucks and taken to a suitable landfill or spoil disposal location. About two to four truckloads, 26 to 65 yards^3 (20 to 50 m^3), of drill cuttings/fluids would be taken off site per day depending on whether the pilot drill or reaming procedure is being used. Water for the drilling operation would most likely come from a municipal source. A total of about 54,000 gallons (204,000 liters) of water would be needed.

Where the HDD hole would come to the surface in the Harbor, drilling muds would be released into the marine environment. The actual amount of drilling muds released would depend on the method used to ream out the hole, and whether the hole could be flushed out before it is punched through. With back reaming, because the reamer starts from the Harbor side of the hole, drilling fluids and sediments would escape from the hole into the marine environment as the hole is reamed. About 94 $yards^3$ (72 m^3) of drilling muds would be released into the Harbor with back reaming. With forward reaming, the hole would not be completed into the Harbor until after the hole was reamed from the land side. The reamer would complete the last 65 to 98 feet (20 to 30 m) of the hole, allowing that portion of the drillings fluids and cuttings to be released into the marine environment. About 6.5 $yards^3$ (5 m^3) of drilling muds would be released into the Harbor with forward reaming. Sea Breeze plans to use the forward reaming method for the HDD hole, if possible, to lessen the amount of drilling muds that would be released into the Harbor.

Once piloting and reaming are completed, casing pipes would likely be installed in some sections of the hole for stability.

After the casing pipes have been set in place, the HDD hole would be ready for cable installation. As described in Section 2.1.1.3, a small guide wire would be used to pull the marine cable through the HDD hole to the terrestrial end of the hole, where the marine cable would be spliced into the terrestrial cable. To facilitate the threading of the cable through the HDD hole, some excavation in the sea bed at the marine HDD end point may be required to provide a smooth curve in the sea floor to the hole. This excavated area would also be used to catch drilling fluids and soil cuttings so that they could be removed.

The area that would be excavated around the HDD hole end point would either be about 28 feet (8.5 m) in diameter and less than 2 feet (0.5 m) deep, or it would be about 18 feet (5 m) in diameter and 3 feet (1 m) deep. The amount of soil excavated would likely be about 40 $yards^3$ (30.5 m^3). A clam-shell type excavator stationed on the boat would remove the soil, placing it on the boat. After the HDD hole was punched through into the Harbor, the drilling fluids and soil cuttings would likely settle into the excavated area, where they would be removed with vacuum-type equipment. Once the cable was threaded into the HDD hole, the soil would then be placed back into the excavated area to fill it in.

The HDD hole drilling machinery would operate continuously for about 23 days, 24 hours a day, seven days a week. Continuous operation would be necessary in order to maintain hole stability and to prevent damage to the specialized equipment needed. The entire HDD hole operation including mobilization and demobilization would take about 32 days.

2.1.3 Terrestrial Direct Current Cable

Once the marine cable has been pulled through the HDD hole, it would be spliced to the terrestrial DC cable. The terrestrial cable would extend generally southwest on Liberty Street from the HDD construction site to the proposed converter station site near the BPA Port Angeles Substation (see Figure 2-7). The total length of the terrestrial cable would be about 0.8 miles (1.3 km).

The terrestrial cable would have two insulated copper conductors that would be larger than the marine cable, but without the additional corrosion protection needed for the marine cable. Each conductor would be about 4 inches (10 cm) in diameter and would weigh about 23 pounds per foot (34 kg/m). The conductors would be laid at least 19 inches (48 cm) apart to allow for cooling of the conductors.

The terrestrial DC cable is manufactured in 1,300-foot or 2,600-foot (396-m or 792-m) lengths, requiring prefabricated joints, unlike the marine cable, which comes as one continuous length. The terrestrial cable would be installed in segments and spliced in the field.

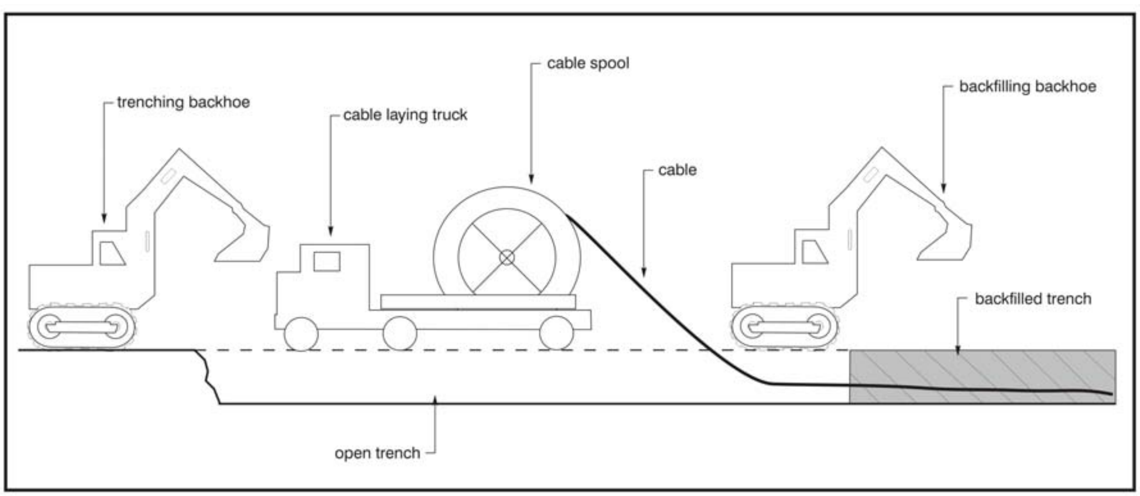
2.1.3.1 Terrestrial Trenching

From the Liberty Street HDD hole, the terrestrial cable would head southwest in a trench that would be dug in Liberty Street (see Figure 2-7). The underground cable would cross 11 streets, including Highway 101 and East Lauridsen Boulevard. The cable would then connect into the proposed converter station, which would be built between East Lauridsen Boulevard and East Park Avenue, near the BPA Port Angeles Substation (see Section 2.1.4).

Standard utility trenching methods would be used to underground the cable, including cutting and removing the asphalt, excavating the trench with backhoes, and using dump trucks to haul off the debris (see Figure 2-10). The trench would be about 4 to 8 feet (1 to 2.5 m) deep and about 6 feet (2 m) wide at the surface. Prior to placing the cable in the trench, sand or other similar bedding material would be laid in the trench to protect the cable. A truck-mounted cable reel would lay the cable in the trench. Appropriate backfill materials, such as sand, soil with crushed rock, or other material would be used to refill the trench as determined by the City of Port Angeles.

Some blasting would be required between E. 5th and E. 8th streets (about 600 feet [183 m]) to obtain the desired depth for the cable. Two blasts per day for 10 days are proposed. These blasts would occur during the terrestrial DC cable construction period of 7:00 a.m. to 7:00 p.m.

The proposed cable would be trenched through most street intersections, but the cable would be pulled under the two major intersections of Highway 101 and East Lauridsen Boulevard after a hole is bored or a conduit is pushed under the road. This would avoid disruption of traffic on these major arterials in the project vicinity. Once construction is complete, all streets affected by the trenching activities would be repaved.



Source: SeaBreeze 2006.

Figure 2-10 Typical Terrestrial Cable Trenching

2.1.3.2 Utility Cable Protection

Cable protection would include placing concrete over the cable and placing warning marker tape about 2 feet (0.6 m) above the cable. Where the cable would be in areas with many service connections or with the potential for future residential service connections, protection may also include installing the cable below the existing utilities.

2.1.3.3 Construction

The construction crew would be about 12 people, with a separate restoration crew of two to three people following the main excavation. Equipment fueling would occur at the work site. Contractors would have contingency plans and spill containment kits should an accidental fuel spill occur. Work vehicles would be parked in designated parking areas where they would not interfere with existing business or other activities to the fullest extent practical. Designated parking areas would be determined prior to construction with input from residents and the City of Port Angeles engineering staff.

During construction, control signs and personnel would direct traffic around the construction zone. Access to private driveways would be maintained as much as possible, except for brief times when construction occurs next to a driveway. To the fullest extent practical, private driveways and intersections would not be blocked during non-working hours; temporary access would be maintained using steel plates to cover the trench.

The trenching, cable laying, backfilling, and repaving activities required for installation of the terrestrial DC cable would be expected to take about 32 days. Construction would occur seven days a week, but would be limited to between 7:00 a.m. and 7:00 p.m. each day. If additional road repaving or repairs are required by City of Port Angeles engineering staff, the construction period may be extended by a few days.

2.1.4 Converter Station

Because the cable would be DC and the BPA transmission grid is AC, a converter station would be required to convert the electricity from DC to AC. Sea Breeze has proposed construction of the converter station on about 5 acres (2 hectares [ha]) of land owned by Clallam County Public Utility District (PUD). The site is just north of BPA's Port Angeles Substation, between East Park Avenue and East Lauridsen Boulevard. (See Figures 2-7 and 2-11.) The converter station would occupy about 3.75 acres (1.5 ha) of the site.

The proposed converter station would include a building and an electrical yard, with a fence enclosing most of the property (see Figure 2-12 for an example of a typical converter station). The proposed building would be about 100 feet (30 m) wide, 200 feet (60 m) long, and 40 feet (12 m) tall. If necessary, the building would be built 5 feet (1.5 m) below grade to meet the City's 35-foot (10.7-m) building height limit. The fence would be a combination of decorative and chain-link fencing.

The building would house thyristor valves that convert the power, converter reactors, DC capacitors, AC and DC filters, high-frequency filters, a valve cooling system, cooling fans, and power transformers. The building would be designed with sound insulation to minimize noise.

The electrical yard would contain a DC yard with DC filtering and switches, and an AC yard connecting to a proposed 230-kV transmission line that would in-turn connect to BPA's substation. All equipment would be mounted directly on low foundation/supports. Four transformers (including 1 spare) would be in the yard. The yard would have secondary spill containment for transformer insulating oil.

Four existing overhead transmission lines that cross the property would need to be moved to make space for the converter station. The City of Port Angeles has two 69-kV wood pole lines across the property. Clallam County PUD has one 69-kV line and one 115-kV line, both on wood poles across the property. These lines would need to be rebuilt and could be either reconfigured above ground across the property, or buried under the converter station. If the lines are rebuilt above ground, towers larger than the existing towers would likely be needed.

Construction of the proposed converter station would require grading and soil excavation, as well as some tree clearing. Clallam County PUD cleared trees on about one third of the property in 2004 when the 115-kV line was built (see Figure 2-11). An additional 2 acres (0.8 ha) of trees of various sizes would be cleared on the site for the station. On the west side of the property, Sea Breeze plans to leave a 100-foot (30-m) wide buffer of trees and other vegetation, although large trees that would pose a potential wind fall hazard would be removed in this buffer area. Sea Breeze also intends to leave the existing tree buffer on the east side of the converter station site next to South Liberty Street.

About 1,000 $yards^3$ (765 m^3) of soil would be removed from the site and transported to an approved fill site.

Initial construction on the site would include the installation of erosion-control measures, portable construction operation buildings, and establishing contractor laydown and parking areas. After grading and site preparation, the building foundations would be constructed, followed by wall construction and plumbing and electrical components. Typical construction equipment that would be used would include excavators, vibrating rollers, cement trucks, and a medium-sized crane.

After construction, Sea Breeze would landscape and install slats on the surrounding chain-link fence to lessen views of the converter station.

Source: ABB

Figure 2-12 Typical Converter Station (300 MW)

Construction of the converter station would require about 30 personnel for civil construction and about 10 for electrical construction. The converter station would take about 10 months to build, including landscaping and final stormwater management facilities. Construction activities would be limited to between 7:00 a.m. and 7:00 p.m. each day.

2.1.5 Terrestrial Alternating Current Cable

AC power from the converter station would be transmitted to BPA's existing Port Angeles Substation via a proposed underground 230-kV AC transmission cable. The AC cable would exit the converter station on the southwest corner to the intersection of East Park Avenue and Porter Street and then head south down Porter Street before entering the west side of BPA's Port Angeles Substation property (see Figure 2-11). The length of the AC cable would depend on the routing option onto BPA property (see below), but would be less than 1,300 feet (396 m) long.

The cable would consist of three insulated conductors, buried either 18 or 24 inches (46 to 61 cm) apart within a concrete conduit. Standard utility trenching methods would be used to underground the cable (see Section 2.1.3.1). The trench would be about 4 to 6 feet (1 to 2.5 m) deep and about 6 feet (2 m) wide at the surface. The conduit would be placed in the trench and backfilled with insulating material. The insulating material required would depend on the soil's heat resistance. Protection would include placing concrete over the cable and placing warning marker tape about 2 feet (0.6 m) above the cable. The street would be repaired and repaved. During construction, control signs and personnel would direct traffic around the construction zone.

There are two short routing options for this 230-kV cable as it enters the BPA property (see Figure 2-11):

- **Option A** (BPA Preferred) – Under this option, the cable would be about 1,250 feet (380 m) long. The AC cable would enter BPA property from Porter Street about 1,000 feet (305 m) from the intersection of East Park Avenue and Porter Street (see

Figure 2-11). The underground cable would head east for about 235 feet (72 m) before connecting to terminating structures in the new substation yard. The route onto the property would go through the wooded area adjacent to East Park Avenue. The AC cable trench would require clearing a 20 to 50-foot (6 to 15-m) wide swath of existing trees through this wooded area.

- **Option B** – Under this option the cable would be about 1,070 feet (327 m) long. The AC cable would enter the BPA property from Porter Street about 710 feet (216 m) from the intersection of East Park Avenue and Porter Street (see Figure 2-11). The underground cable would head southeast for about 360 feet (110 m) before connecting to the terminating structure within the new substation yard. The route onto the property would follow the edge of the wooded area between the existing yard and the wooded area adjacent to East Park Avenue. The AC cable trench would require clearing a 20 to 30-foot (6 to 9-m) wide swath of existing trees along the edge of the wooded area.

For either Option A or Option B, trenching methods would be similar to those used in the street, except that no pavement would be removed and the backfill would include a final layer of top soil for plants to germinate. The area above the cable would need to remain clear of trees, but low-growing vegetation would be allowed to grow.

Two fiber cables would create a communication link between the converter station and the substation (see Figure 2-11). One fiber cable would be placed in the trench with the terrestrial AC cable down Porter Street, then veer off the route into its own small trench onto BPA property. This fiber trench would leave Porter Street and head to the substation relay house along the edge of an existing access road. The other fiber cable would enter substation property via a bore hole under East Park Avenue and travel to the relay house along existing cable corridors within the BPA substation yard.

Installation of the AC cable and fiber cable lines would take about 21 days and would likely overlap with construction of the converter station. AC cable installation activities would be limited to between 7:00 a.m. and 7:00 p.m. each day.

2.1.6 Port Angeles Substation Interconnection

The terrestrial AC cable would connect into BPA's Port Angeles Substation, which is located on the corner of East Park Avenue and Porter Street. The interconnection would require a new relay house, the relocation of an existing transmission line and other structures on BPA property, and the expansion of the existing electrical yard to accommodate new electrical equipment.

The electrical yard expansion would be south of the existing fence line on an undeveloped portion (about 2 acres [1 ha]) of BPA's property that has grasses, shrubs, and some trees (see Figure 2-11). The fence line would be extended south by about 264 feet (65 m) and the expansion would be about 300 feet (91 m) wide, the same width as the existing yard. The yard would also be expanded around the relay house and where the AC cable enters the yard expansion area (see Figure 2-11).

The expanded yard would contain a terminating structure (where the AC cable would come above ground and connect into the substation), two substation dead-end towers, 230-kV bus (where the current flows on an aluminum pipe set about 15 feet [4.6 m] off the ground), and power circuit breakers and disconnect switches (devices used to mechanically disconnect or isolate equipment). The tallest equipment for the interconnection would be the lattice-steel terminating structures, which would be about 76 feet (23 m) tall, similar to the existing dead-end towers at the substation. Other existing equipment within the yard would need to be rearranged to accommodate substation changes.

A chain-link barbed-wire topped fence, similar to the one that currently surrounds the substation, would surround the expanded portion of the substation yard for security and public safety. A 10-foot (3-m) wide gravel buffer would be just outside the fence.

A new relay house for communications equipment would be built on the west side of the existing electrical yard (see Figure 2-11). The relay house would be about 36 feet by 20 feet (11 m by 6 m) and about 17 feet (5 m) tall. New communication equipment would also be required in other BPA substations and radio stations in the area. However, this equipment would not require new buildings, but would be installed in existing buildings.

Expanding the substation yard and building the relay house would require that some existing transmission lines and the structures that support them be moved. An existing 115-kV transmission line entering the substation on the west side would need to be moved farther west by about 50 to 75 feet (14 to 23 m) (see Figure 2-11). One new structure would be needed for the move. The structure would either be a three-pole wood structure as it is now, or a steel pole structure and would be about 80 to 100 feet (24 to 31 m) tall. An existing tower for this line that is located just outside BPA property to the south would require new guy wires to support the line move. Two other transmission line towers on BPA property that enter the substation from the southeast may need to be rebuilt essentially in place.

Some existing trees, including mature Douglas fir and hardwoods, would need to be removed for the yard expansion and the relocation of the existing transmission line. Many of the trees on the west side of the property would be removed. A 100-foot (30-m) wide corridor would be cleared of trees where the 115-kV transmission line would be relocated. Low-growing vegetation would be allowed to grow or be left in the corridor. Trees outside of the corridor that could potentially fall close enough to the line to cause an arc or electrical outage of the line would also be removed. About 2.4 acres (1.0 ha) of trees would be cut on the west side. Along Porter Street, the shorter deciduous trees or trees that would not pose a hazard to the line would remain in order to retain some vegetative buffer.

On the east side, towards the college, existing trees within the expansion area would be cleared, as well as a 50 to 100-foot (15 to 30-m) wide strip of trees outside the expansion area that could pose a threat of falling onto substation equipment and disrupting service. About 1 acre (0.4 ha) of trees would be cut on the east side.

Because of the slope of the land in the expansion area, the electrical yard would be terraced. The expanded yard would sit 10 to 20 feet (3 to 6 m) higher than the existing yard and would require the excavation of about 20,000 yards^3 (15,000 m^3) of soil. Most of the soil excavated would be used on-site for the terracing. The expanded portion of the substation yard would be surfaced with a 3-inch (8-cm) layer of rock selected for its insulating properties and used to protect operation and maintenance personnel from danger in the rare event of an electrical failure in the substation.

Construction equipment would likely enter the site from an existing dirt access road from Porter Street (see Figure 2-11). To accommodate vehicles (tractor/trailers) that require a large turning radius, BPA would widen the road approach to 50 feet (15 m). The existing access road would need to be graded and graveled to a 16-foot (5-m) wide road surface with side slopes. If construction occurs during the rainy season, a temporary retention pond may be used on-site to contain turbid stormwater runoff. A retention pond could be a vegetated swale, a shallow excavation, or a combination of detaining systems. If needed, the retention pond would likely be located in the undeveloped area between the proposed relay house and Porter Street.

The substation interconnection construction would require 25-35 workers and would take about 6 months. Construction activities would be limited to between 7:00 a.m. and 7:00 p.m. each day.

The substation expansion would be designed to accommodate future equipment installations that would be required for the potential interconnection of new transmission lines. Any subsequent proposals for transmission lines would require additional environmental review and public process.

2.1.7 Staging Areas

Staging areas for a portable office, materials, equipment, machinery, and vehicles required for the project would likely be located at the converter station site, on BPA property, and along the streets where the work would occur. If additional space would be needed, contractors would rent a previously-developed (paved or graveled) lot close to project activities.

2.1.8 Construction and Schedule

If DOE/OE and BPA decide to grant the necessary permits and approvals to Sea Breeze as described in Chapter 1 and Sea Breeze is granted appropriate permits required by other regulatory agencies (see Chapter 4), Sea Breeze could construct the U.S. portion of its proposed project. Construction could likely start sometime in 2007 and would be expected to be completed in about 12 to 18 months. Table 2-1 summarizes the construction schedule for the various project components. Some portions of the construction could occur simultaneously.

Table 2-1 Construction Schedule Summary

Project Component	Construction Timeframe	Equipment Required	Personnel Required
Marine DC Cable	About 2-3 weeks, including about three days to connect the marine cable to the upland portion.	Cable-laying vessel, plow, hydrojet or hydroplow, small boats.	About 40 people, all specially-trained, full time crew of the ship. One or two small boats may be contracted locally for support.
Horizontal Directional Drill Hole	About 32 days, including mobilization and demobilization	Truck-mounted HDD rig, power generators, drill pipe and racks, storage tanks for the drilling muds, and clean water storage tanks.	About 10-12 people, most specially-trained as crew for the HDD machine and system. Support equipment (trucks, small excavator, traffic control) contracted locally
Terrestrial DC Cable	About 32 days	Excavator/trencher, trucks supplying and removing material, backhoe, vibrating rollers, and plate tampers.	About 12 people, with a separate restoration crew of 2 to 3 personnel following the main excavation. Installation crew of 2 to 4 specially-trained people. Remainder of crew would be retained locally or regionally, depending on requirements for expertise and experience.
Converter Station	About 10 months	Excavators, trucks, vibrating rollers, cement trucks, medium-sized crane.	About 30 people for civil construction and about 10 people for electrical construction. Local or regional firms with suitable expertise would be considered.
Terrestrial AC Cable	About 21 days	Excavator/trencher, trucks supplying and removing material, backhoe, vibrating rollers, and plate tampers	About 12 people, with a separate restoration crew of 2 to 3 personnel following the main excavation. Installation crew of 2 to 4 specially-trained people. Remainder of crew would be retained locally or regionally, depending on requirements for expertise and experience.
Port Angeles Substation Interconnection	About 6 months	One small crane and one medium size crane, two bulldozers, a grader, two track-mounted excavators, one bucket truck, 3 line-trucks, and dump trucks.	About 25-35 construction workers. Up to 6 workers could be hired locally depending on requirements for expertise and experience.

2.1.9 Operation and Maintenance

Sea Breeze or its successors in interest would be responsible for operating and maintaining all aspects of the proposed project except for the Port Angeles Substation equipment, which would be operated and maintained by BPA. The following describes the respective operation and maintenance activities that would be conducted by Sea Breeze and BPA.

Operation and control of the cable and converter station by Sea Breeze would be primarily conducted from a remote site, but there would be regularly-scheduled site inspections and maintenance activities.

The proposed marine and terrestrial cables would be flexible and protected against impacts and abrasion (thick jackets of polymer, lead alloy sheathing, polyethylene, tensile armor, and an outer polypropylene yarn). Because the cable would be buried, it would not be exposed to wind, ice build-up, or trees falling on the line (typical events that cause outages on overhead lines). However, if a fault (break or short circuit) occurred in the cable from impact by an external force or insulation failure, the location of the break would not be visible and would need to be located. The converter protections would roughly estimate the location of the fault, then precise electrical test methods (such as an impulse generator or Thumper and a Time Domain Reflection meter or fault bridge) would be used to find the precise location.

For the DC and AC terrestrial cables, once a fault was located, Sea Breeze would excavate that portion of the cable and repair it by installing a new section of cable and joints. In the marine crossing, the cable would have to be retrieved with special undersea equipment. A line would be connected to the cable and the cable would be pulled up onto a cable repair vessel. If the cable had been severed, both ends would have to be retrieved and a new cable spliced to the existing cable. However, substantial progress has been made in the development of an underwater repair methodology which could eliminate the necessity to raise the cable ends above the water for repair. It is likely that this methodology would be commercially available before the proposed in-service date of this project.

Repairs would not be expected to be needed on the cable in the HDD hole following installation and testing. If maintenance was necessary, the cable bundle would be pulled out from the HDD hole and repaired, then pulled back into the hole.

Maintenance of the converter station equipment by Sea Breeze would not require periodic shutdowns of main circuit equipment because of redundancies built into the system. If required, most repairs could be performed quickly because control units are integrated and could be replaced promptly.

For the proposed substation equipment, BPA would perform periodic maintenance and emergency repairs when necessary. BPA also would maintain vegetation so as to not interfere with BPA facilities. If vegetation maintenance is needed, BPA may use a number of different methods: manual (hand-pulling, chainsaws), mechanical (roller-choppers, brush-hogs), biological (insects or fungus for attacking noxious weeds), and herbicides. BPA's vegetation management would be guided by its Transmission System Vegetation Management Program EIS (DOE/EIS-0285) and Record of Decision (August 2000, Supplemented, February 2001)[4].

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[4] http://www.efw.bpa.gov/environmental_services/Document_Library/Vegetation_Management/

2.1.10 Transmission Service

In its request submitted to BPA, Sea Breeze has requested only interconnection of its proposed project to BPA's transmission system, and has not requested transmission service over BPA's system. Accordingly, the Proposed Action by BPA is only for interconnection of Sea Breeze's project, and does not include any provision for transmission service. BPA would need to make a separate decision on any future request for transmission service related to Sea Breeze's proposed project, and would include appropriate NEPA considerations in making such a decision.

In addition, Sea Breeze has proposed that its project be connected to BPA's transmission system without any improvements made to this system. Sea Breeze believes that such an interconnection is both financially and operationally feasible, and they will accept restrictions on transmitting power across the system to maintain reliability. These restrictions will include limiting power flow from or to the new interconnection through the BPA transmission system on the Olympic Peninsula at certain times of the day and at certain times of the year. Any transmission service that is provided without system improvements would reflect these restrictions.

Sea Breeze has proposed its project as a "merchant" transmission line, meaning that although the line would be constructed and operated by Sea Breeze, Sea Breeze intends to sell transmission service rights to its proposed cable at negotiated rates. As a result, Sea Breeze has requested and received approval from the Federal Energy Regulatory Commission (FERC) to conduct an "open season" for the purpose of selling long-term point-to-point transmission service rights associated with its proposed project, up to the full capacity of the cable. Sea Breeze held its open season in fall 2005, in which it received one bid for 125 MW of north-to-south transmission scheduling rights (increased to 275 MW in subsequent discussions) from Sea Breeze Energy Inc., a wind energy development firm affiliated with Sea Breeze Olympic Converter LP (the project proponent of the cable project that is the subject of this EIS).

2.2 No Action Alternative

Under the No Action Alternative, DOE would deny Sea Breeze's request for a Presidential permit or deny the request to connect to the federal transmission system, or both. In either case, the Port Angeles–Juan de Fuca transmission cable would not be constructed as described and the potential environmental consequences due to the proposed project would not occur.

2.3 Alternatives Considered but Eliminated from Detailed Study

DOE considered various alternatives for its Proposed Action, including alternatives that were either suggested or that responded to concerns raised during the scoping process for this EIS. In addition, Sea Breeze analyzed many alternatives for its proposed project, ranging from the type of transmission technology to the location of project facilities. DOE considered several factors in assessing whether a potential alternative merited detailed study in this EIS, or could be eliminated from further study. DOE considered whether the potential alternative would meet the identified purposes and need for the Proposed Action (see Chapter 1). In addition, DOE considered whether the alternative would be practical and feasible from a technical, economic, and common sense perspective, consistent with Council of Environmental Quality (CEQ) guidance on assessing the reasonableness of alternatives. Finally, DOE considered whether the alternative would have greater adverse environmental effects than the Proposed Action.

This section summarizes the alternatives that were considered, but which have been eliminated from detailed study in this EIS.

2.3.1 Electrical Cable Technology Alternatives

Sea Breeze considered two types of cables other than the proposed cable:

- Low-pressure oil-filled (LPOF) or low-pressure fluid-filled (LOFF) paper-lapped cable; and
- Solid, mass-impregnated paper-insulated cable.

High-voltage DC cables that are either LPOF or LOFF have the potential for leaking oil or fluids into the surrounding environment. They are also not practical for long distances, especially in an undersea application, because the oil must be kept under pressure. In addition, compared to the other cable types, they have higher power losses (Grainger and Jenkins 1998). Therefore, the use of LPOF or LOFF cables was eliminated from further consideration.

Solid mass-impregnated paper-insulated cables are the most widely used insulation for conventional high-voltage DC cables. In this technology the lapped-paper insulation is impregnated with a high-viscosity fluid, which is not under pressure. The use of solid, mass-impregnated paper-insulated cables was also dropped from further consideration because of the availability of the more advanced extruded insulation technology which does not use liquid or oil in the insulation.

Further discussion about high-voltage DC technology is found in Appendix A.

2.3.2 HDD Hole Alternative

A deep-water site was considered for the opening of the HDD hole in the Harbor. The site was about 60 feet (18 m) below mean lower low water. This site would have required that the HDD hole be about 1,600-feet (600-m) longer than the Proposed Action. The extra length of the HDD hole would require more drilling time and would disrupt the local neighborhood longer. Also, more drilling fluids would be released in the Harbor, which could create greater water quality impacts. For these reasons, the site was dropped from further consideration.

2.3.3 Marine to Upland Transition Alternative

Sea Breeze considered placing the cable in a trench (rather than the proposed HDD hole) from the marine environment to the upland environment. This method would have more marine, nearshore, and shoreland environmental impacts than the proposed HDD hole. Trenching through the nearshore environment would have directly impacted aquatic vegetation and marine life (shellfish). Trenching also would have had a potential to impact undiscovered cultural sites along the shoreline, which is an area of high probability for cultural sites.

Once on shore, to avoid the bluff near the shoreline, the cable would have to be placed under ground, in a narrow access road (North Ennis Creek Road) adjacent to Ennis Creek. The bluff and the area next to Ennis Creek have been designated as a critical area by the City of Port Angeles, and the City indicated that it is unlikely they would approve a cable in or next to North Ennis Creek Road (Johns 2005).

For these reasons, this alternative was dropped from further consideration.

2.3.4 Terrestrial Cable Route Alternatives

Sea Breeze considered two other upland cable routes: using Ennis Street to the east and Jones Street to the west. Both routes would require going two additional blocks, but would cross the same number of streets, including Highway 101. The number of residential and business districts impacted would have also been the same. There were no advantages to existing land uses, existing utilities, or environmental features, so the Ennis Street and Jones Street routes were eliminated.

2.3.5 Converter Station Site Alternative

As suggested by Sea Breeze, BPA considered placing the converter station on BPA property south of BPA's Port Angeles Substation. The site is under existing transmission lines that enter the substation. BPA determined that there was not enough room for the converter station, as well as equipment for interconnection of the proposed cable, and any potential lines that would leave the substation in the future. In additional, this alternative would have required a similarly-sized area for construction as the proposed converter station, which would have included tree clearing, grading, and visual impacts. Overall environmental impacts would not have been lessened with this alternative. For these reasons, the site was dropped from further consideration.

2.4 Summary of the Impacts of the Proposed Action and No Action Alternative

Table 2-2 summarizes the impacts of the Proposed Action and the No Action Alternative.

Table 2-2 Summary of Impacts of the Proposed Action and the No Action Alternative

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
Water Resources		
• Temporary sedimentation would occur in the Strait and Harbor due to trenching, excavating around HDD hole end point, and propeller wash from ship work in shallow waters. Between 2,200 to 29,000 yards^3 (1,700 to 22,000 m^3) of sediment would disperse within the Strait and about 8,600 yards^3 (6,500 m^3) of sediment within the Harbor. Coarse sediments would settle closer to the trench, fine sediment would disperse up to 0.5 miles (0.8 km) on either side of the cable or down current. • Turbidity levels would not likely raise 5 NTU above background levels and would likely be within Washington state requirements. • In the event of an accidental oil or fuel spill, contamination of the marine environment, ground water, or Ennis, White, or Peabody Creeks could occur. • Sea floor work in the Harbor would suspend existing low-level contaminated sediments. • Operation of the cable in the marine environment would increase water temperatures within 4 inches (10 cm) of the sediment surface by less than 1.8°F (1°C). • During punch through of the HDD hole into Harbor and in the event of an accidental bedrock fracture, drilling fluids/cuttings would be released into the Harbor. • Water would be used during drilling operations and would need disposal. • Terrestrial construction has the potential to create stormwater run-off impacts to nearby waterways of Ennis, White or Peabody creeks.	• Institute control measures on the cable vessel to prevent the potential risk of an accidental release of any hazardous materials. (Mitigation measure also listed in Marine Habitat and Wildlife Section.) • Use oil-adsorbent materials, maintained on the construction vessels, in the event of a petroleum product spill on the deck and/or if any sheen is observed in the water. (Mitigation measure also listed in Marine Habitat and Wildlife Section.) • Use the following measures to lessen impacts of HDD: ➢ Determine the optimal HDD trajectory to minimize the chance of bedrock or soil fractures using a geotechnical evaluation of the geologic formations to be drilled. ➢ Install a casing through near surface formations susceptible to fracturing (e.g., highly permeable unconsolidated materials) during drilling to seal off permeable formations. ➢ Monitor losses of drilling mud. If a loss of drilling mud volume or pressure is detected, slow drilling to assess whether a fracture to the surface may have occurred. ➢ Visually monitor the ground surface and surface waters to facilitate quick identification and response to a fracture. ➢ If a fracture occurs, decrease amount of drilling muds lost by, for example, increasing the viscosity of the drilling mud to seal fractures and stabilize the borehole. ➢ Contain any release of drilling mud onto the ground surface using BMPs (which could include the use of silt fences, sand bags, straw bales, or booms) to reduce the possibility of muds reaching surface waters.	No Impact

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	➢ Contain any potential drilling mud releases to Ennis Creek or Port Angeles Harbor above the high tide line with sand bags, and collect for disposal. ➢ Use a forward-reaming drilling method, if practicable, to reduce volumes of drilling mud and drill cutting discharges. ➢ Flush the drilling mud and cuttings from the borehole, if practicable, prior to the final drill out during a forward-reaming process. ➢ Excavate a containment area at the HDD hole end point to collect and contain drilling muds and cuttings. • Develop and implement a Spill Prevention, Control and Countermeasure Plan to minimize the potential for spills of fuels, oils, or other potentially hazardous materials to reach the shallow perched groundwater or surface water bodies. • Develop a dewatering plan for trenching activities in consultation with the City of Port Angeles. (Mitigation measure also listed in Terrestrial Fish and Wildlife Section.) • Keep vehicles and equipment in good working order to prevent oil and fuel leaks. • Limit site disturbance to the minimum area necessary to complete construction activities to the extent practicable. (Mitigation measure also listed in Geology and Soils Section.) • Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to lessen soil erosion and improve water quality of stormwater run-off. (Mitigation measure also listed in Geology and Soils Section.) • For the SWPPP, use management practices contained in the Storm Water Management Manual for Western Washington (e.g., use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices, placing them prior to the onset of the rainy season and monitoring and maintaining them	

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	until disturbed areas have stabilized). (Mitigation measure also listed in Geology and Soils Section.) • If needed, develop temporary retention pond (a vegetated swale, a shallow excavation, or a combination of detaining systems) to contain turbid stormwater during construction at Port Angeles Substation. (Mitigation measure also listed in Geology and Soils Section.) • Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for short and long-term erosion. (Mitigation measure also listed in Vegetation and Wetlands, Geology and Soils, and Air Quality sections.) • Provide appropriate long-term stormwater detention or control facilities at the converter station site as required by the City of Port Angeles. (Mitigation measure also listed in Terrestrial Fish and Wildlife Section.)	
Vegetation and Wetlands		
• About 5 acres (2 ha) of marine vegetation (primarily brown algae, at depths shallower than 100 feet [30 m]) would be removed with expected re-colonization within one to two seasons. • Terrestrial vegetation on converter station site property and BPA property would be removed: a total of about 3.8 acres (1.5 ha) of grasses, 1.3 acres (0.5 ha) of young trees and shrubs, 4.5 acres (1.8 ha) of trees, and select trees within vegetative buffer areas on the east and west sides of converter station site. • Noxious weeds would likely colonize disturbed areas. • No T&E plant species or wetlands would be impacted.	• Assess impacts to nearshore habitat at the HDD hole end point and trenching to a depth of 70 feet (21 m) within two weeks after cable installation is completed and again after 1 year during the growing season (June 1 through October 1). If the marine vegetation has not recovered to 80 percent of the density of adjacent areas within 3 years of monitoring, develop a mitigation plan in consultation with WDFW. (Mitigation measure also listed in Marine Habitat and Wildlife Section.) • Cut or crush vegetation, rather than blade, in areas that will remain vegetated in order to maximize the ability of plants to resprout. (Mitigation measure also listed in Geology and Soils Section.) • Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to limit the potential for colonization by noxious weeds. (Mitigation	No Impact

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
	measure also listed in Water Resources, Geology and Soils, and Air Quality sections.)	
Marine Habitat and Wildlife		
• The cable laying vessel, trenching equipment, and HDD containment area excavation would have direct contact impacts to marine benthic species within about 38 to 46 acres (15 to 19 ha), incidental contact with fish, and unlikely contact with marine mammals. • Turbidity would impact benthic or slow moving species and, to a lesser extent, fish and marine mammals. • Resuspension of low-level contaminated sediments could contribute to biomagnification of contaminants in species within the food chain. • Accidental oil or fuel spills could impact marine species, especially sea birds. • About 5 acres (2 ha) of algae/kelp habitat would be removed with expected re-vegetation within 1 or 2 growing seasons. • About 7 to 14 acres (3 to 6 ha) of benthic and sediment habitat would change due to increased sediment temperatures. • Underwater noise levels from ship and equipment could impact fish and mammals (avoidance of work vicinity, possible disruption of communications, migration, and feeding behaviors), and potentially disrupt benthic species behaviors, including filter feeding and foraging. Noise levels near the trenching activities would be considered harassment to marine mammals and fish by the National Marine Fisheries Services. • Ship presence, noise, and vessel wakes could temporarily disturb sea birds, including bird colony areas in the Harbor area. • Artificial light used at night on the cable-laying vessel could potentially disrupt	• Monitor the beach within 100 feet (30.5 m) of the route for concentrations of crab and urchins, under the supervision of a qualified biologist over a two-week period prior to installation for any work occurring between February and September. If the survey identifies an unexpectedly high concentration of these priority species that would be directly impacted by the project, then determine additional mitigation requirements in consultation with WDFW. • Mitigate loss of geoducks based on agreements with the DNR and WDFW. • Use procedures that reduce the volume of drilling muds and drill cutting discharged into the Harbor. (See HDD mitigation measures listed in Water Resources Section.) • Assess impacts to nearshore habitat from drilling and trenching to a depth of 70 feet (21 m) within two weeks after cable installation is completed and again after one year during the growing season between June 1 and October 1. If the marine vegetation has not recovered to 80 percent of the density of adjacent areas within three years of monitoring, develop a mitigation plan in consultation from WDFW. (Mitigation measure also listed in Vegetation and Wetlands Section.) • Institute control measures on the cable vessel to prevent the potential risk of an accidental release of any hazardous materials. (Mitigation measure also listed in Water Resources Section.) • Use oil-adsorbent materials, maintained on the construction vessels, in the event of a petroleum product spill on the deck and/or if any sheen is observed in the water. (Mitigation measure also listed in Water Resources Section.) • Implement appropriate mitigation measures as required by USFWS or NOAA through	No Impact

<table>
<tr><th colspan="2">Proposed Action</th><th rowspan="2">No Action

Potential Impacts</th></tr>
<tr><th>Potential Impacts</th><th>Mitigation Measures</th></tr>
<tr><td>behaviors of fish and marine mammals attracted to the light.</td><td>consultations, including potential work windows (for example, no in-water work from March 2 through July 15 to protect migrating juvenile salmonids and from February 16 through July 15 to protect bull trout).

• Mitigate potential impacts to state-protected species as required by WDFW based on consultation (for example, marine work windows outside of the gray whale migration season of June 1 to November 30).

• Have a trained marine mammal observer on board the cable-laying vessel to record any observations of marine mammals, especially ESA-listed species. During nighttime operations, the observer would use low-light binoculars for observations. During cable-laying operations, observations for a minimum of 10 minutes would be made at least four times each hour. If any listed species are observed, the following procedures would be followed:

➢ If an individual or group of animals is observed at 1,000 yards (915 m) from the cable-laying vessel, then behavior would be recorded and vessel operators would be notified. No change to cable-laying operations would be required.

➢ If an individual or group of animals approaches the cable-laying vessel within 500 yards (457 m), the behavior of the animals would continue to be recorded, and the vessel operator would be notified and preparations to reduce the speed of cable-laying operations would begin.

➢ If an individual or group of animals approaches the cable-laying vessel within 400 yards (366 m), the behavior of the animals would continue to be recorded, the vessel operator would be notified, and cable-laying operations would be reduced to one-half speed. The operator would prepare to stop cable-laying operation if necessary.

➢ If an individual or group of animals approaches the cable-laying vessel within</td><td></td></tr>
</table>

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	100 yards (91 m), the behavior of the animals would continue to be recorded, the vessel operator would be notified, and cable-laying operations would cease until the individual or group of animals had moved beyond 100 yards (91 m) of the vessel; then reduced-speed operations may resume. • Deploy any item or material that has the potential for entangling marine mammals only as long as necessary to perform its task, and then immediately remove it from the project site. • In the unlikely event that a marine mammal becomes entangled, immediately notify the stranding coordinator at NOAA Fisheries so that a rescue effort can be initiated. • Aim work lights on the cable-laying ship and support vessels to illuminate work areas in such a way as to minimize spilling light into adjacent areas of water.	
Terrestrial Wildlife and Freshwater Fish		
• Low quality terrestrial habitat would be removed; about 4.5 acres (1.8 ha) of forested habitat and 5 acres (2 ha) of grass/shrub habitat. • HDD drilling, equipment, and blasting would cause noise and visual disturbance to birds (including possible low-level impacts to foraging eagles) and small terrestrial mammals in the vicinity of project construction. • If stormwater runoff was not controlled, impacts to fish of Ennis, White, and Peabody creeks could occur.	• Implement appropriate mitigation measures for bald eagle if required by USFWS through Section 7 consultations. Measures could include limitations to construction timing for noise producing activities. • Develop a dewatering plan for trenching activities in consultation with the City of Port Angeles. (Mitigation measure also listed in Water Resources Section.) • Provide appropriate long-term stormwater detention or control facilities at the converter station site so that peak flows in Ennis and White creeks are not increased from pre-existing levels. (Mitigation measure also listed in Water Resources Section.)	No Impact
Geology and Soils		
• Sea floor sediment would be disturbed (22,000 to 145,000 yards^3 [17,000 to 111,000 m^3] in the Strait and 43,000 yards^3 [33,000 m^3] in the Harbor) with 10 to 20 percent of the disturbed sediment	• Limit site disturbance to the minimum area necessary to complete construction activities to the extent practicable. (Mitigation measure also listed in Water Resources Section.)	No Impact

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
dispersing up to about 0.5 mile (0.8 km) from its original place on the sea floor. • Disturbed low-level contaminants in Harbor would stay in the contaminated area, disperse to another contaminated area, or disperse to an unpolluted area. • Sand waves could increase sediment depth over the buried cable or erode sediment resulting in a thinning or removal of sediment cover over the cable. • If a severe earthquake occurred, the cable could potentially be severed, at which time the power would automatically shut off. • Drilling muds (bentonite) would be released into Harbor as the HDD drill bit exits through the seafloor. Though drilling mud would be removed to the extent possible, some drilling mud would inevitably remain and become part of the sediment make-up. • About 215 yards3 (165 m^3) of drill cuttings from the HDD hole would be removed and taken to a suitable landfill or spoil disposal location. • Construction of the terrestrial cables, converter station, and interconnection at BPA's substation would impact soil through disturbance, removal, exposure to run-off, compaction, and covering with buildings or rock. • Up to about 1000 $yards^3$ (765 m^3) of soil would be removed from the converter station site and about 20,000 $yards^3$ (15,000 m^3) of soil would be excavated at Port Angeles Substation and used on site for terracing.	• Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to lessen soil erosion and improve water quality of stormwater run-off. (Mitigation measure also listed in Water Resources Section.) • For the SWPPP, use management practices contained in the Storm Water Management Manual for Western Washington (e.g., use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices, placing them prior to the onset of the rainy season and monitoring and maintaining until disturbed areas have stabilized). (Mitigation measure also listed in Water Resources Section.) • If needed, develop temporary retention pond (a vegetated swale, a shallow excavation, or a combination of detaining systems) to contain turbid stormwater during construction at Port Angeles Substation. (Mitigation measure also listed in Water Resources Section.) • Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for short and long-term erosion. (Mitigation measure also listed in Water Resources, Vegetation and Wetlands, and Air Quality Sections.) • Cut or crush vegetation, rather than blade, in areas that will remain vegetated in order to maximize the ability of plant roots to keep soil intact. (Mitigation measure also listed in Vegetation and Wetlands Section.) • Install trip switches in the converter station to automatically shut off power at the station in the event of strong ground shaking during a seismic event that could damage the transmission system. • Include engineered design and earthquake-resistant construction in all habitable structures to increase the safety of persons occupying the buildings. The minimum seismic design would comply with the Clallam County Building Code	

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
	and applicable Washington State Building Codes. • Design and construct non-habitable project components using earthquake-resistant measures.	
Land Use		
• Construction in the Harbor and marine waters would potentially cause temporary low-level disruption to fishing and ship traffic avoiding the slow-moving cable-laying operations. • Residents near the HDD site would be affected by construction noise, dust, night-time lighting, and traffic disruptions 24 hours/per day, 7 days a week for about 23 days. • Residents along Liberty Street and near the converter station site and BPA's substation would be affected during construction activities: noise (including blasting required along Liberty Street between 5th and 8th streets), dust, and traffic disruptions between 7 a.m. and 7 p.m. • Land use of the converter station site would change from a nearly-vacant lot used for an electrical transmission line corridor and open space (with casual recreation) to a converter station, incrementally increasing the utility-related use of the area. • Land use of the BPA substation property would change from existing open space (with casual recreation) and transmission line corridor to fenced substation yard, incrementally increasing the utility-related use of the area.	• Notify residents and business owners of the construction schedule, potential impacts, and contact numbers for project managers who can provide information or address concerns during construction. • Contact residents along the route prior to construction to coordinate driveway access and reduce interference. • Provide appropriate signage for redirecting traffic during construction through coordination with the City of Port Angeles Public Works Department. • Implement measures to reduce visual and noise impacts (see Visual and Noise sections).	No Impact
Visual Resources		
• Some residents along streets near the Harbor and visitors to the Discovery Trail would see the cable-laying ship, supporting boats, and other equipment during construction of the marine cable in the Harbor. • Residents and motorists near the HDD construction site, along the terrestrial cable	• Seek and incorporate input from local residents and planning officials about the design of the exterior of the converter station. • Design the converter station building exterior to be compatible with facilities of Peninsula College. This could be accomplished by doing	No Impact

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
route, near the converter station site, and near the BPA substation would have temporary views of construction activities. • The new converter station building, electrical yard, and required tree removal and thinning, would create a long-term change in the landscape of the area. • The expansion of the BPA electrical yard for the interconnection work and required tree removal and thinning would create long-term visual impacts to residents in the vicinity, increasing the existing utility/industrial-related look to the area.	the following: ➢ Installing decorative walls, ➢ Planting native trees and understory vegetation, ➢ Installing slats on chain-link fencing. • Revegetate exposed ground above underground AC lines on BPA property with vegetation that does not jeopardize safety or reliability of equipment.	
Socioeconomics		
• Impacts to socioeconomics would include some low-level positive impacts to the economy due to construction worker and project supply spending. • Short-term increases in population and housing (campgrounds, RV parks, hotels) needs would occur with about 85 construction workers coming from outside the area to work on various portions of the project at different points in time. • Addition of potential jobs in the area would include some local workers for non-specialty construction jobs and a full-time security guard and a local grounds maintenance company for the converter station. • Construction in the Harbor and marine waters would create temporary low-level impacts as fishing and ship traffic would need to avoid the slow-moving cable-laying operations. • There would be a minimal risk that the cable could be snagged or hit by ship anchors.	• Record the location of the marine cable bundle on navigational charts. (Mitigation measure also listed in Health and Safety Section.) • Bury the cable bundle deep enough to provide protection, up to 12 feet (3.6 m), in areas of soft soils and potential ship anchorage. (Mitigation measure also listed in Health and Safety Section.)	No Impact
Cultural Resources		
• Potential impacts to undiscovered cultural resources during marine trenching or terrestrial ground disturbing activities (no sites were identified through surveys).	• Identify and locate any potential historic resources along the marine cable corridor using existing sonar data, if adequate, or gather additional data, if necessary.	No Impact

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	• Determine final cable alignment to avoid potentially significant resources. • Develop an Inadvertent Discovery Plan that details crew member responsibilities for reporting in the event of a discovery during marine cable installation. • Ensure tribal monitors from the Lower Elwha Klallam Tribe are present during excavation at the HDD platform, trenching along level areas of the terrestrial route, and excavation at the converter station site and interconnection site work. • Develop an Inadvertent Discovery Plan that details construction worker responsibilities for reporting in the event of a discovery during terrestrial excavation. • If final placement of the project elements results in unavoidable adverse impacts to a significant resource, prepare a Mitigation Plan to retrieve the scientific and historical information that makes the site significant under the direction of a qualified archeologist and in consultation with Washington SHPO and the Lower Elwha Klallam Tribe. • Stop work immediately and notify local law enforcement officials, the Washington SHPO, and the Lower Elwha Klallam Tribe if project activities expose human remains, either in the form of burials or isolated bones or teeth, or other mortuary items.	
Noise		
• Temporary noise impacts would occur for 2 to 3 days, 24 hours/day from the cable laying ship and equipment work in the Harbor. • The HDD hole construction site would generate noise 24 hours/day for 23 consecutive days at levels slightly louder than typical construction noise levels, reducing to ambient noise levels at a distance of about 600 feet (183 m) from the drilling equipment.	• Incorporate the use of sound attenuating techniques at the HDD construction site to reduce noise levels as close to its source as possible. • Do not permit the use of equipment with back-up warning devices between 7:00 p.m. and 7:00 a.m. • Reduce the speed of the HDD drill during non-exempt hours, if possible, to limit noise levels.	No Impact

Proposed Action		No Action
Potential Impacts	**Mitigation Measures**	**Potential Impacts**
• Terrestrial construction of the cable trenching, converter station, and interconnection work would generate construction level noise, between 7 a.m. and 7 p.m. Required blasting along Liberty Street between 5th and 8th streets would include two blasts per day for 10 days. • Operation of the converter station may raise existing noise levels in the immediate vicinity.	• Enclose major noise-generating equipment inside the converter station building, where possible. • Place cooling fans at the converter station away from residents.	
Health and Safety		
• The proposed project health and safety issues include potential shocks, increased exposures to magnetic fields, use and disposal of toxic and hazardous materials, and risk of fire. • Accidental electric shocks could occur in the rare event that future construction excavating equipment breached the insulation of the cable. • Potential low level increased exposure to magnetic fields could occur along the AC cable depending on the cable configuration and placement in the street and the distance from the cable to a residence. • Accidental oil spills, mishandling, or storage of any toxic or hazardous waste products could occur if mitigation measures were not followed. • Potential fire could occur without appropriate fire protection systems installed in the converter station or if trees were allowed to grow too close to overhead lines or electrical yards.	• Obtain approval from the City of Port Angeles prior to construction in city streets. • Provide detailed information about the location of the cable (as-builts) to the Port Angeles Engineering Department so construction crews can avoid it. • Install concrete and warning tape above buried terrestrial cables to protect the cable from possible damage during future excavation in the street near the cable corridor. • Record the location of the marine cable bundle on navigational charts. (Mitigation measure also listed in Socioeconomic Section.) • Bury the cable bundle deep enough to provide protection, up to 12 feet (3.6 m), in areas of soft soils and potential ship anchorage. (Mitigation measure also listed in Socioeconomic Section.) • Configure and locate buried AC cables and overhead transmission lines to lessen potential magnetic field exposures. • Abide by all federal, state, and local requirements for the storage, handling, transport, disposal, and spill reporting requirements of all products and deleterious substances. Personnel handling or transporting such materials would be adequately trained and, where necessary, material safety data sheets (MSDS) would be kept on hand.	No Impact

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	• Ensure proper refueling procedures are followed and that containment materials are on hand at refueling locations. • Maintain “good-housekeeping practices” within the hazardous material containment area, including prompt cleanup of spills. • Place all transformers inside a bermed area large enough to capture the full potential volume of any oil spills or leaks from the equipment. • Conduct periodic inspections around all transformers to look for any minor leaks or spills. • Install appropriate fire detectors, sprinklers, and other fire safety equipment in the converter station. • Remove vegetation and tall trees that could pose a danger to overhead transmission lines, converter station equipment, and electrical yards to prevent potential damage during large windstorms or from tree deadfalls.	
Air Quality		
• Construction activities would create dust (5 tons [4.5 metric tons]), and heavy equipment, ships, generators, and vehicles would emit exhaust pollutants.	• Apply water to exposed soils at construction sites as necessary to control dust. • Clean accumulated dirt, as necessary, from roads along the cable construction corridor and near the converter station and substation. • Implement dust control measures, as necessary, to limit dust releases from dump trucks (such as wetting dry soil). • Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for	No Impact

Proposed Action		No Action
Potential Impacts	Mitigation Measures	Potential Impacts
	wind blown erosion. (Mitigation measure also listed in Water Resources, Vegetation and Wetlands, and Geology and Soils sections.) • Keep all construction equipment in good running condition to minimize emissions from internal combustion engines and ensure that odor impacts are kept to a minimum. • To the degree practical, minimize equipment idling for long periods of time.	

3.0 Affected Environment, Environmental Impacts, and Mitigation Measures

This chapter describes the existing environmental resources that could be affected by the Proposed Action and the potential impacts that the Proposed Action and the No Action Alterative would have on those resources.

The potential impacts described were determined through research and field observation by environmental specialists and information provided by agency and public comments. More specific information on methodology for each resource is provided as appropriate. Each resource lists the mitigation measures that would lessen impacts and the impacts that would be unavoidable.

Toward the end of the chapter, Cumulative Impacts are described, followed by discussions of Intentional Destructive Acts, Relationship Between Short-Term Uses of the Environment and Long-Term Productivity, Irreversible or Irretrievable Commitments of Resources, and Adverse Impacts that Cannot be Avoided.

3.1 Water Resources

3.1.1 Affected Environment

3.1.1.1 Marine Water

The underwater portion of the project crosses the Strait of Juan de Fuca, a major marine surface water system, and approaches land through Port Angeles Harbor. The Strait is the primary connection between the Pacific Ocean and Puget Sound – Georgia Basin inland marine waterways. The Juan de Fuca Strait Basin is a 100-mile (160-km) long, U-shaped estuary varying from 13.7 miles (22 km) wide at its western end to greater than 24.9 miles (40 km) wide at its eastern boundary (Thomson 1994). See Figure 3-1.

The Strait is a two-layer hydrologic system. The upper 100-foot (30-m) layer is relatively fresh water created by river inflows. Below 100 feet (30 m), the lower layer is more saline from ocean-influenced inflow at depth. Tidal ranges average between 4 and 10 feet (1.2 and 3 m). The north- and west-facing shorelines along the Strait are subject to the largest waves and are considered high-energy areas (Department of Ecology 2003).

Net water movement through the Strait varies in relation to depth, with net movement of cold, deep oceanic water being eastward and net movement of fresher, warmer surface water being westward. The Strait is a wind-dominated system with currents that can change dramatically within hours in response to regional and larger-scale oceanic winds (Entrix 2004). Typical surface currents in the western Strait may reach 2 to 4 knots (2.3 to 4.6 mph, or 3.7 to 7.4 kph), with little variability in the summer and high variability in the winter.

The primary (about 75 percent) freshwater source to the Strait is the Fraser River in B.C. (NOAA 2005a) (see Figure 3-1). Besides this river, strong seasonal storms contribute pulses of both fresh water and sediment into the system, especially within the nearshore zone during winter and spring. The middle, deep area of the Strait is well-mixed, cold, and rich in nutrients (such as fixed nitrogen and phosphorus) throughout the year. This contrasts with the shallow, enclosed embayments, such as at Port Angeles, which are seasonally, strongly stratified and occasionally nutrient-limited (Entrix 2004).

Water temperature in the Strait is well mixed and homogeneous during much of the year, although stratification can occur in late summer. In winter, the water temperatures range from 46 to 50°F (8 to 10°C). Summer temperatures range from 45°F (7°C) at depth to 68°F (20°C) at the surface (Thomson 1994). The water column in the nearshore area is mixed throughout the year with higher temperatures of water and substrate.

The Strait is classified as Class AA marine water (extraordinary water quality). The Washington State Department of Ecology classifies the marine waters of the Strait as excellent for aquatic life uses and other designated uses including shellfish harvesting, primary contact (i.e., activities that may result in ingestion of or immersion into water, such as swimming or kayaking), fishing, navigation, wildlife habitat, and aesthetics. The Department of Ecology turbidity requirements do not allow human activity to increase turbidity greater than 5 nephelometric turbidity units (NTU) over background levels if background levels are less than 50 NTU (WAC 173-201A).

Recent monitoring for a cable project in Puget Sound measured background turbidity levels to be 0.49 NTU (Gannon 2005). Because of the Strait's generally similar characteristics, it is expected that the Strait would have turbidity measurements approximately equal to or less than the Puget Sound.

The Port Angeles Harbor is contained within Ediz Hook, a 4-mile (6.4-km) sand spit (see Figure 2-1). The City of Port Angeles contains 26 miles (42 km) of marine shoreline, including Ediz Hook (City of Port Angeles 2004). The marine waters of Port Angeles Harbor are currently listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act. The impairment listing is due to low dissolved oxygen levels, which can stress populations of fish and other aquatic organisms (Clallam County 2004). In addition, water quality and marine sediments in Port Angeles Harbor have been adversely impacted by discharges of wastewater from the former Rayonier pulp mill. The former Rayonier pulp mill outfall is about 4,400 feet (1,300 m) east-north-east from the proposed the HDD hole end point. While water quality has likely recovered since the closure of the mill in 1997, residual marine sediments are still degraded.

Pollutants known to be present in the harbor sediments as a result of mill operations include the following:

- Wood waste, which covers a large portion of the harbor bottom, with coverage heaviest in the nearshore areas;
- Organic chemicals, including polychlorinated biphenyls (PCBs), dioxins/furans, pesticides, phenols, polycyclic aromatic hydrocarbons, and resin acids, with the highest concentrations located near the mill outfall in Port Angeles Harbor; and
- Inorganic chemicals, including mercury, lead, arsenic, cadmium, copper, selenium, and zinc, with the highest concentrations located near the mill outfall in Port Angeles Harbor (Malcolm Pirnie 2005; E & E 1998).

Portions of the harbor may exhibit toxic conditions to benthic organisms (Malcolm Pirnie 2005). Distribution of the sediment contaminants is not uniform, but discrete zones of contamination have not been delineated (Malcolm Pirnie 2005; E & E 1998).

Harbor sediments have been previously sampled in the general vicinity of the HDD hole end point and submarine cable alignment (about 175 to 925 feet [53 to 282 m] away). Of these samples, one sample contained 4-methylphenol at a concentration of 1.01 milligrams per kilogram (mg/kg). This concentration exceeds the Washington State Sediment Management Standards (SMS) - Sediment Quality Standard (SQS) and Cleanup Screening Level (CSL) of 0.67 mg/kg (E & E 1998). A subsequent sample collected during 2005 at the same location contained 4-methylphenol at a concentration below the 0.67 mg/kg SMS (Malcolm Pirnie 2005). No other contaminants were detected in these samples at concentrations exceeding the SMS.

3.1.1.2 Creeks, Streams, and Floodplains

The project is in the vicinity of three creeks (White Creek, Ennis Creek, and Peabody Creek) that flow from the foothills of the Olympic Mountains into the Strait (see Figure 2-4). The terrestrial cable route in Liberty Street parallels White Creek located about 1,200 feet (366 m) to the east. The cable corridor is about 50 to 100 feet (15 to 30 m) above the creek bed. White Creek flows into Ennis Creek, which is further east, at about river mile 0.3 (river kilometer 0.48). The mouth of Ennis Creek has been channelized between the former Rayonier pulp mill and Port Angeles's wastewater treatment plant. Peabody Creek is about 2,500 feet (760 m) west of the proposed converter station site and the Port Angeles Substation interconnection site.

Ennis Creek, below its confluence with White Creek, and the entire reach of White Creek within the general project area have been classified as impaired or compromised by Clallam County (Clallam County 2004). Residential and commercial development have increased sediment loading and introduced contaminants through stormwater or surface runoff. White Creek is “heavily” degraded from urbanization and has little production potential for fish habitat due to extensive culverting and impassable culverts (Haring 1999). The former Rayonier pulp mill contaminated Ennis Creek with various toxic substances including dioxins, heavy metals, and PCBs. Pulp waste was responsible for a fish kill in 1982. Historically a direct sewage discharge to Ennis Creek was discovered, and livestock access to the creek may also contribute to elevated levels of fecal coliform bacteria (Haring 1999). The outlets of two storm drains empty into the White Creek ravine in the vicinity of the planned transmission cable route (near the east end of 5th Street and near Front Street) and one stormwater outfall is below the confluence of White and Ennis creeks (City of Port Angeles 2006).

Peabody Creek is a small rain-dominated drainage that enters Port Angeles Harbor in the downtown area. This creek is listed on the Washington State 303d list as a Category 5 polluted waters due to fecal coliform bacteria contamination from the creek mouth in Port Angeles Harbor to stream mile 1.507 (stream kilometer 2.43). Upstream of this point the stream is a Category 2, waters of concern. Currently, Peabody Creek receives combined sewer overflows for a portion of Port Angeles and point and non-point stormwater runoff. Stormwater from BPA's Port Angeles Substation empties into the city's piped storm drainage system that discharges into Peabody Creek.

In the vicinity of the project, the creeks have limited channelized floodplains.

The Port Angeles area receives an average annual precipitation of 25 inches (63.5 cm); about 80 percent falls in October through March (Entrix 2004). The City of Port Angeles is integrating the state's stormwater plan into its plan including minimizing the use of combined sewer outflows and disconnecting residential stormwater drains from sewer lines (Entrix 2004). In the area of the proposed converter station and Port Angeles Substation, the city's existing storm drainage system is not currently sized to accommodate future development.

3.1.1.3 Groundwater

In general, groundwater in the project area exists in shallow and deep saturated zones.

The shallow seasonal perched groundwater zones occur within portions of two soil types: Clallam gravelly sandy loam, 0 to 15 percent slopes, and Clallam-Hoypus gravelly sandy loams, 0 to 15 percent slopes (see also Section 3.5). Most of the shallow groundwater in these areas is present during the wetter fall, winter, and/or spring months when groundwater is perched above a layer of low-permeability compact glacial till in the soil. Depth to the seasonal perched water table may range from less than 1 foot (0.3 m) to greater than 4 feet (1.2 m) deep (USDA SCS 1987). Groundwater in the shallow seasonally perched zone is assumed to follow the topography and flow north.

At the Rayonier pulp mill site, groundwater exists within a shallow, unconfined saturated zone within the near-surface fill and alluvial deposits below the coastal bluff. The base of the saturated zone at this location is the top of compact glacial till deposits, which vary from 12 feet (3.7 m) to greater than 30 feet (9.1 m) below ground surface (bgs). Depth to groundwater in this area ranges from 2.5 to 17 feet (0.8 to 5.2 m) bgs (Integral 2004). Groundwater flows generally northward in the shallow groundwater within the fill and alluvium at the Rayonier pulp mill site (Integral 2004).

Information on deeper groundwater in the project area is limited because there are few wells or other sources of data on deeper groundwater conditions within the area (Department of Ecology

2006). Five water wells are within about 0.5 miles (0.8 km) of the project. Based on the well closest to the proposed converter station (about 105 feet [32 m] to the west), groundwater exists in a groundwater-bearing zone at 57 feet (17 m). This zone underlies a layer of compact glacial till (Schasse, Wegmann, and Polenz 2004). A well about 210 feet (65 m) south of the substation expansion site was completed to 80 feet (24.4 m) deep through predominantly clayey materials containing sand and gravel, though groundwater appeared at a depth of 35 feet (11 m). No wells are north of the converter station site except the shallow monitoring wells at the Rayonier pulp mill site (Department of Ecology 2006). Deeper groundwater likely follows the topography and flows north.

The City of Port Angeles lies over areas that are mapped by Clallam County as Critical Aquifer Recharge Areas (CARAs) (Entrix 2004). The County designated CARAs to recognize their sensitive recharge dynamics and to manage options for protecting and improving recharge conditions. The entire length of the proposed Liberty Street route overlies a mapped CARA as does the lower two-thirds of the White Creek riparian corridor and the coastal lowland. The City of Port Angeles does not recognize the Clallam County CARA designation for the project or other areas within the city limits.

3.1.2 Environmental Impacts – Proposed Action

Water quality can be impacted by physical aspects (temperature, sediment, flow), chemical aspects (metals, bacteria, contaminants, pH, dissolved oxygen), and by biological aspects (biological conditions of the water body). The proposed project could potentially impact some aspects of water quality.

3.1.2.1 Marine DC Cable

Construction of the marine cable could impact water quality of the Strait and Port Angeles Harbor through sedimentation, contamination from oil or fuel spills, and dispersal of contaminated sediments. Operation of the cable could impact marine water quality through heat dispersal.

Sedimentation

The cable trench would be about 3 to 5 feet (0.9 to 1.5 m) deep and 4 to 16 feet (1 to 5 m) wide, depending on the make-up of the seafloor sediments. About 80 to 90 percent of the sediment disturbed to create the trench would settle back into the trench or within an adjacent 20-foot (6-m) side-cast area. Experience on other cable laying projects using a hydroplow or equivalent technology indicates that the remaining 10 to 20 percent of the disturbed sediment would be dispersed into the water column (Gannon 2005).

Over the 9 miles (14 km) of the marine trenching within the Strait on the U.S. side, between 2,200 to 29,000 $yards^3$ (1,700 to 22,000 m^3) of sediment would be dispersed into the water column over a three-week period. The range of sediment dispersal shows the best and worst case, and is indicative of the various potential depths and widths of the trench and whether 10 or 20 percent of the sediment would actual be dispersed. The sediment would be entrained in the water column; coarse sediments would settle closer to the trench, while fine sediment would be dispersed up to 0.5 miles (0.8 km) on either side of the cable or down current, raising turbidity above background levels. Geophysical surveys of the cable corridor show that the deep water portion of the route has is primarily sandy and sandy-gravel material, limiting the potential for sediment mobility during trenching (see Appendix C for maps of the geology of the sea floor along the corridor). Depending on the currents, which are generally between 1.5 and 3.5 knots (2.8 and 6.5 kph), elevated turbidity would decrease rapidly with distance from the cable installation site (Nightingale and Simenstad 2001) and would be diluted to background levels within minutes to hours of the passing trenching equipment.

In September 2005, monitoring of a similar cable installation project in the Puget Sound area found that hydroplow and hand-jetting trenching equipment increased turbidity levels less than 5 NTU over the background levels, except for one sampling which was 5.25 NTU above background levels (Gannon 2005). The proposed cable trenching would cause similar turbidity levels.

Because the project would not likely raise turbidity levels within the Strait 5 NTU above background levels (assuming background levels of around 0.5 NTU), the levels would likely be within Washington state requirements. If turbidity levels stayed within state requirements, as expected, turbidity impacts to water quality in the Strait from trenching would be ***low.*** If turbidity levels rose above the state standards, impacts would be ***moderate***.

For about 1 mile (1.6 km) coming into the Harbor, the cable may be trenched up to 12 feet (4 m) deep. About 8,600 $yards^3$ (6,500 m^3) of sediment would be dispersed over 2 to 3 days. Estuarine and nearshore waters are naturally more turbid than deep waters due to wave action, photosynthesis and plankton production, and river influences. The shallow-water nearshore zone has relatively fine sediment (silt/sand) overlaying coarse sediment (gravelly sand), and, therefore, has a higher risk for sediment mobilization into the water column than in the Strait during trenching.

In the Harbor, turbidity would be increased not only from trenching, but also by prop-wash (the thrust of water from the ship's propeller) from the cable-laying ship working in relatively shallow waters. Prop-wash from a ship the size likely to be used (4540 horsepower), can cause water velocities of greater than 4.3 ft/sec (1.3 m/sec) at the sea floor when the ship is in water depths of about 50 feet (15 m) or less (Jay 2002). Prop-wash at this velocity is sufficient to cause dispersion of seafloor sediments and increase turbidity. The disturbed area could be up to 1,300 feet (400 m) behind the ship. In Port Angeles Harbor, the ship would work for about a 0.5 mile (0.8 km) in waters less than 55 feet (17 m) deep. The area disturbed by the prop-wash would be similar to the area disturbed by trenching, but would increase the time frame of disturbance (first from the prop-wash, then by trenching). Prop-wash turbidity impacts would be similar to trenching (coarser sediments settling within about 20 feet [6 m] from the disturbance area and finer sediments dispersing up to 0.5 mile [0.8 km] away); however, it would not be dissimilar to turbidity generated by other vessels in the Harbor. Increased turbidity impacts to water quality in the Harbor from trenching and prop-wash would be ***low-to-moderate***. (See Section 3.1.2.2 for additional sedimentation impacts in the Harbor from excavation of the area at the HDD hole end point.)

Contamination from Spills

In the case of an accidental oil or fuel spill, water quality in the general vicinity could be impacted. An accidental spill would likely release only small amounts of contaminant at any one time since the ship would not carry fuel or oil as cargo. The ship would have an oil spill containment plan and clean-up measures would be implemented immediately (see Section 3.1.3, Mitigation Measures). Any spill would be diluted quickly in the Strait or the Harbor. Potential water quality impacts from oil spills would be ***low***.

Dispersal of Contaminated Sediments

As described in Section 3.1.1.1, most recent contaminate monitoring and sampling in the Harbor found contaminates in the project area at concentrations within Washington state sediment standards. The turbidity caused by trenching and prop-wash in the Harbor and in the vicinity of the Rayonier pulp mill outfall could disperse existing contaminates up to 0.5 mile (0.8 km) from sea bed activities. Water quality could be impaired for up to three days and up to 0.5 miles from the trenching until sediments settle. Because the existing contaminate levels are not in concentrations above state standards and impacts from the proposed project would be temporary, water quality impacts from dispersed contaminates would be ***low-to-moderate***.

Maintenance and Repair

Maintenance or repair of the marine cable would have similar impacts as the initial cable construction (sedimentation, potential contamination from spills, and contaminate dispersal), but to a much lesser extent since it would be expected that only small portions of the cable would require repair at any one time. Impacts would be ***low***.

Heat Dispersal

Although the proposed marine cable would be insulated, heat would be emitted during operation into the surrounding environment. At maximum capacity, the temperature of the submarine power cable core would be about 158 degrees Fahrenheit (°F) (70 degrees Celsius [°C]). The heat produced by the cable would be generated at about 29 watts per foot (94 watts/m) of cable. This heat would dissipate from the cable depending on the burial depth and sediment characteristics, specifically moisture content and thermal resistivity. Cool water temperatures would dissipate the heat. At deeper burial depths, where there is less pore water within the sediments, the temperature would disperse more slowly. Heat loss decays with an increasing distance from the cable (i.e., sediments closest to the cable would have greater increases in temperature than those even a short distance away).

Table 3-1 summarizes the expected changes in sediment temperature at various distances from the cable for varying cable burial depths. For example, at a burial depth of 6 feet (2 m), the expected increase in sediment surface temperature would be about a maximum of 4.1°F (2.3°C). The expected increase in sediment surface temperature at a burial depth of about 1.6 feet (0.5 m) would be a maximum of 5.4°F (3°C). In all cases, the temperature change within 4 inches (10 cm) of the sediment surface would be less than 1.8°F (less than 1°C).

Table 3-1 Temperature Effects of Cable Operation in Substrate and Water Directly Above the Cable

Cable Burial Depth feet (m)	Temperature Increase (°F [°C]) in Substrate at Various Distances Directly Above Cable					Change in Water Temperature °F (°C) 4 inches (10 cm) Above the Cable
	At 4 inches (10 cm)	At 16 inches (40 cm)	At 20 inches (50 cm)	At 35 inches (90 cm)	At 6 feet (2 m)	
0	N/A	N/A	N/A	N/A	N/A	<1.8 (< 1)
1.6 (0.5)	60.3 (33.5)	15.1 (8.4)	5.4 (3)	N/A	N/A	<1.8 (< 1)
3 (1)	75.2 (41.8)	38.5 (21.4)	31.1 (17.3)	7.9 (4.4)	N/A	< 1.8 (< 1)
6 (2)	93.6 (52)	59.4 (33)	52.7 (29.3)	34.0 (18.9)	4.1 (2.3)	< 1.8 (< 1)

N/A = not applicable.

The heat present at the sediment surface would be transferred from the sediment to the overlying water. Pore water flow in the voids of the sediment would inhibit the full transfer of heat from the cable to the sediment surface.

The ocean water temperatures range from 46°F to 68°F (8°C to 20°C) depending on time of year and water depth. Currents above the seafloor would help dissipate the heat transferred from the sediment. For all burial depths, the temperature change in the water column within 4 inches (10 cm) above the cable would be less than 1.8°F (1°C) (see Table 3-1).

Up to 2,000 feet (610 m) of the cable may be placed on the seafloor surface rather than buried to avoid impacting existing cables. In these areas, the temperature of the cable surface would be about 140°F (60°C). The cables would be covered by concrete mattresses in some locations (see Section 2.1.1.2). In the locations where the cable would be exposed to the overlying water, the heat would dissipate quickly and at a distance of 4 inches (10 cm) above the cable, the change in water temperature would be less than 1.8°F (<1°C).

Although the water temperature increase above the heated sediment or exposed cable would be measurable, the increase would be within the natural variation of seasonal temperatures. Impacts of increases in water temperature above the cable would be ***low***.

3.1.2.2 Horizontal Directional Drill Hole

Potential environmental consequences of the HDD hole end point construction include sedimentation, release of drilling fluids and cuttings, suspension of potentially contaminated sediments in the Harbor, use and disposal of water used for drilling, and accidental spills of petroleum products. (See Chapter 2 for a description of the proposed drilling process and drilling muds used.)

Sedimentation

Sedimentation at the HDD hole end point would be from excavation of about 40 yards^3 (31 m^3) of soil around the hole. The excavated area would soften the angle of the cable as it would enter the hole and would also catch drilling fluids and cuttings that leave the hole. Soil excavated at this end point would likely be placed on a barge until the drilling process is done, then used to refill the area. A clam-shell type excavator would remove the soil and place it on the barge. Some of the sediment would disperse as the soil is brought from a depth of about 30 feet (9 m) up to the surface. The excavation of the sediment and the replacement of the soil at the HDD hole end point in the Harbor would most likely create turbidity levels greater than those from trenching, but over a shorter period of time (about 1 to 2 days). The Harbor is a smaller body of water than the Strait for the sediments to disperse in and it has naturally high turbidity levels, but the additional turbidity created by the proposed project would meet state standards and not raise levels more than 5 NTU over background levels. Water quality impacts would be ***low-to-moderate***.

Release of Drilling Fluids and Cuttings

Drilling mud could be released if an accidental fracture in the bedrock or soil occurs during drilling of the HDD hole. Fracturing would most likely occur in highly permeable unconsolidated formations or fractured bedrock. If the fracture goes all the way to the soil surface (referred to as “frac out”), the pressurized drilling fluids could escape. If the fracture occurred into Lower Ennis Creek or Port Angeles Harbor, the drilling fluids (about 63 to 220 yards^3 [48 to 168 m^3]) containing water, bentonite, and soil particles would be released into water. Bentonite is considered inert and non-toxic, a naturally-occurring mud. When drilling fluids are released into water the bentonite and mud cuttings tend to clump and settle, while the water (which is 95 percent of the volume) containing some of the bentonite would disperse. The HDD hole would pass under the estuarine portion of Ennis Creek. Any release of drilling fluids into this estuarine area would likely flush out into the Harbor. A release of drilling fluids into Ennis Creek or the Harbor as a result of fractured bedrock would have a ***low-to-moderate*** impact to water quality, with a low probability of occurrence (see Section 3.1.3, Mitigation Measures).

Drilling fluids/or muds would be released into the Harbor when the drill completes the HDD hole at its end point. Discharge of drilling fluids and drill cuttings would occur as the drill bit breaks through the substrate and exits into the Harbor. The volume of drilling fluids discharged, combined with drill cuttings if the borehole is flushed, would be less than 6.5 yards^3 (5 m^3); the volume of drilling fluids discharged if the borehole is not flushed would be about 94 yards^3 (72 m^3).

Discharged Drill cuttings would settle into the excavated hole constructed at the HDD hole end point. Most of the bentonite would drop out of suspension near the end of the hole, and some would be dispersed by currents. Solids would be removed from the Harbor by a vacuum pump. If the borehole can be flushed and fewer than 6.5 yards^3 (5 m^3) of material are released, then the impacts to water quality would be ***low***. If the borehole cannot be flushed and about 94 yards^3 (72 m^3) of drilling fluids would be released, then the impacts to water quality would be ***moderate***. The possibility of flushing the borehole remains unknown until actual construction begins.

Measures that would be implemented to minimize the amount of drilling mud and cuttings released to Port Angeles Harbor are discussed in Section 3.1.3.

Suspension of Potentially Contaminated Sediments at the HDD Hole End Point

Similar to trenching in the Harbor, drilling at the HDD hole end point and excavating a catch area for drilling fluids and cuttings would stir up potentially contaminated sediments. Resuspension of contaminated sediment from work at the HDD hole end point would create temporary water quality impacts similar to the impacts from trenching. Impacts would be ***low-to-moderate***.

Use and Disposal of Water

Drilling operations would require water from the municipal water source for about 23 days. About 54,000 gallons (204,000 liters) of water would be needed, and would be disposed of as stormwater. Impacts to existing water sources would be ***low***.

Floodplains

The project work would not be in the floodplains for White Creek, Ennis Creek, or Peabody Creek. The HDD would pass far beneath the Ennis Creek floodplain and estuary where it enters the Harbor. There would be ***no*** impact to floodplains.

Contamination from Spills

In the case of an accidental oil or fuel spill, the spill could make its way to shallow ground water or Ennis Creek, and perhaps make its way into the Harbor via Ennis Creek. An uncontained spill would impact water quality in these areas. However, an accidental spill would likely release only small amounts of contaminant at any one time and an oil spill containment plan and clean-up measures would be implemented immediately (see Section 3.1.3, Mitigation Measures). Potential water quality impacts from fuel or oil spills would be ***low***.

Maintenance and Repair

If the cable within the HDD hole needs repair, the impacts to water quality would likely be less than those from construction. If the cable needs to be repaired, the bundle would be pulled from the HDD hole and a new cable would be installed. No additional HDD work would be needed. A limited amount of clean and contaminated sediments in the Harbor could be disturbed, suspended in the water and redeposited. Impacts would be ***low***.

3.1.2.3 Terrestrial DC Cable

Construction of the terrestrial DC cable could potentially impact water quality in local waterways if stormwater run-off delivers sediment to the waterways, if shallow groundwater is encountered during construction, or if an oil spill or equipment leak occurs. During operation, impacts could occur during maintenance and repair activities.

Sedimentation

Soil excavated from the trench, stockpiled, then exposed to rain could move off site and wash into the local stormwater system. Depending on the location of the construction, stormwater drainage in this area leads to White Creek or Ennis Creek, then into the Harbor. Construction during the rainy season (October through March) could have greater potential for sedimentation. Without mitigation measures, impacts could potentially be ***moderate***. However, with implementation of stormwater mitigation measures identified in Section 3.1.3, sedimentation impacts to water quality in White Creek and Ennis Creek would be ***low***.

Groundwater

The cable trench would be up to 6 feet (2 m) deep. Cable installation would likely intercept shallow perched groundwater zones if trenching occurs during wet months. Water encountered during trenching would be pumped from the trench using common dewatering techniques. The amount of water that could be generated would depend on the depth of the shallow groundwater table, depth of the trench, permeability of saturated materials, and the amount of time the trench is open. The water would be managed as stormwater. Given the low volumes of groundwater that would likely be encountered and removed, and the short duration of construction (about 32 days), water quality impacts would be ***low***.

Floodplains

The project work would not be in the floodplains for White Creek, Ennis Creek, or Peabody Creek. There would be ***no*** impact to floodplains.

Contamination from Spills

Water contamination potential from spills or leaks of oil or petroleum products during terrestrial cable trenching would be limited, because of the impervious asphalt surface next to the trench. Potential impacts to groundwater would be limited to shallow, seasonal perched groundwater zones. Though unlikely, if fuel or oil reached deeper ground water, water flow would move north, away from existing wells in the project vicinity. There are no water supply wells north of the project construction area. There would be ***no-to-low*** potential ground water quality impacts.

Maintenance and Repair

There would be ***no*** expected impacts to water quality during the operation of the terrestrial DC cable. Impacts to water quality during maintenance or repair would be similar to construction impacts, but to a lesser extent since only portions of the cable would likely require repair at one time, creating fewer potential impacts (sedimentation in stormwater or petroleum spills) than construction. Impacts would be ***low***.

3.1.2.4 Converter Station

Construction of the converter station could have similar water quality impacts as the terrestrial cable trenching (stormwater sedimentation to local water ways, disposal of water encountered during construction, oil spills or equipment leaks), and would also have potential operational water quality impacts due to limited water usage and stormwater disposal.

Sedimentation and Stormwater

Converter station construction would disturb an area of about 3.75 acres (1.5 ha) for construction including about 2 acres (1 ha) of tree and brush removal (see Figure 3-2). Soil work would include vegetation and tree clearing activities, excavation, and grading work (see Section 3.5, Geology and Soils). Potential sources of water degradation would include runoff from soil storage piles and exposed soils during construction. Without mitigation measures, impacts could potentially be ***moderate***. However, with stormwater mitigation measures implemented during construction, sedimentation impacts to water quality in White Creek and Ennis Creek would be ***low***.

The converter station building would create a new impervious area of about 19,300 $feet^2$ (1,800 m^2). The annual stormwater runoff for the building would be about 336,500 $feet^3$ (9,500 m^3). Most of the remaining part of the site would be graveled yard which should allow much of the stormwater to infiltrate the ground and create minimal runoff. The small area of tree removal not covered by the graveled yard would expose soil to storm events until revegetated. Tree removal would also lessen the amount of water taken in by the trees, so even if revegetated with low-growing species and water infiltrating into the soil, there would be more water run-off from the site. The stormwater infrastructure in the area of the converter station is near capacity, and to connect to the city's storm drain, a connection permit from the city would be required. Without stormwater drainage mitigation measures, impact could potentially be ***low-to-moderate***. With stormwater drainage mitigation measures, there would be ***no-to-low*** water quality impacts due to the presence of the converter station.

Floodplains

The project work would not be in the floodplains for White Creek, Ennis Creek, or Peabody Creek. There would be ***no*** impact to floodplains.

Water Usage

The converter station would require a limited quantity of municipal water to use in a cooling system. The cooling system would be a closed-loop system, in which the water would be continuously recycled, with no discharge or contact with contaminants. Therefore, there would be ***no-to-low*** impacts associated with the surface water withdrawals.

Contamination from Spills

Measures would be used to keep all construction vehicles, drilling equipment, and other machinery in good working order during construction of the converter station to prevent petroleum or chemical contaminant releases to soil, which then could leach to groundwater. In the unlikely event of a petroleum or chemical spill, mitigation measures for spill prevention and clean-up would be implemented (see Section 3.1.3). A secondary oil containment system would be included in the station design, which would contain any oil leaked from transformers or other equipment on site. The likelihood of a large contaminant release that would have an adverse impact to groundwater resources is ***low***.

3.1.2.5 Terrestrial AC Cable

Impacts of constructing the AC cable would be similar to the construction of the DC cable (sedimentation to local water ways through stormwater run-off, shallow groundwater encountered during construction, and oil spills or equipment leaks). With mitigation measures, these impacts would be ***low***. Both Options A and B for the terrestrial AC cable entering BPA property would require tree clearing and trenching on BPA property where there is no existing paved road. This would involve construction equipment working in soft soils. In this area, the potential for stormwater run-off (leading to sedimentation) is greater than where the work is within the pavement. See Section 3.1.2.6, Port Angeles Substation Interconnection, for more discussion on water quality impacts of tree clearing for the AC line, as well as for the yard expansion work.

Impacts of constructing the fiber cable for communications would be similar to the AC cable and would create ***temporary*** and ***low*** impacts.

3.1.2.6 Port Angeles Substation Interconnection

Water quality impacts of the Port Angeles Substation interconnection work would be similar to impacts from the converter station site construction. Soils exposed to rain during construction would cause turbid stormwater run-off into local drainages. The substation work would disturb about 2 acres (0.8 ha) for construction and another 2.5 to 3.5 acres (1.0 to 1.4 ha) for tree clearing and transmission line realignment work (see Figure 3-2). Soil work would include terracing the existing sloped property. Degraded stormwater from exposed soils could impact water quality at Peabody Creek (into which the site drains), and without mitigation measures, construction impacts could potentially be ***moderate-to-high***. However, with mitigation measures for construction stormwater, impacts would be ***low***.

The project work would not be in the floodplains for White Creek, Ennis Creek, or Peabody Creek. There would be ***no*** impact to floodplains.

In the long term, increases in stormwater runoff would be caused by the addition of a 720 $foot^2$ (67 m^2) impervious area for the relay house and the removal of about 3.0 acres (1.2 ha) of mature trees. The graveled yard electric yard would allow for some stormwater infiltration, but may create some runoff. Tree removal would expose more soil to storm events until revegetated with low-growing species. Tree removal would also lessen the amount of water that trees would take up in that area, so even if revegetated with low-growing species and water infiltrating into the soil, there would be more water run-off from the site. The long-term water quality impacts from expansion of the yard, the addition of a relatively small impervious area, and the permanent removal of trees would be ***low***.

3.1.3 Mitigation Measures

- Institute control measures on the cable vessel to prevent the potential risk of an accidental release of any hazardous materials. (Mitigation measure also listed in Marine Habitat and Wildlife Section.)
- Use oil-adsorbent materials, maintained on the construction vessels, in the event of a petroleum product spill on the deck and/or if any sheen is observed in the water. (Mitigation measure also listed in Marine Habitat and Wildlife Section.)
- Use the following measures to lessen impacts of HDD:
  - Determine the optimal HDD trajectory to minimize the chance of bedrock or soil fractures using a geotechnical evaluation of the geologic formations to be drilled.
  - Install a casing through near surface formations susceptible to fracturing (e.g., highly permeable unconsolidated materials) during drilling to seal off permeable formations.
  - Monitor losses of drilling mud. If a loss of drilling mud volume or pressure is detected, slow drilling to assess whether a fracture to the surface may have occurred.
  - Visually monitor the ground surface and surface waters to facilitate quick identification and response to a fracture.
  - If a fracture occurs, decrease amount of drilling muds lost by, for example, increasing the viscosity of the drilling mud to seal fractures and stabilize the borehole.
  - Contain any release of drilling mud onto the ground surface using BMPs (which could include the use of silt fences, sand bags, straw bales, or booms) to reduce the possibility of muds reaching surface waters.
  - Contain any potential drilling mud releases to Ennis Creek or Port Angeles Harbor above the high tide line with sand bags, and collect for disposal.
  - Use a forward-reaming drilling method, if practicable, to reduce volumes of drilling mud and drill cutting discharges.
  - Flush the drilling mud and cuttings from the borehole, if practicable, prior to the final drill out during a forward-reaming process.
  - Excavate a containment area at the HDD hole end point to collect and contain drilling muds and cuttings.
- Develop and implement a Spill Prevention, Control and Countermeasure Plan to minimize the potential for spills of fuels, oils, or other potentially hazardous materials to reach the shallow perched groundwater or surface water bodies.
- Develop a dewatering plan for trenching activities in consultation with the City of Port Angeles. (Mitigation measure also listed in Terrestrial Fish and Wildlife Section.)
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks.

- Limit site disturbance to the minimum area necessary to complete construction activities to the extent practicable. (Mitigation measure also listed in Geology and Soils Section.)
- Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to lessen soil erosion and improve water quality of stormwater run-off. (Mitigation measure also listed in Geology and Soils Section.)
- For the SWPPP, use management practices contained in the Storm Water Management Manual for Western Washington (e.g. use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices, placing prior to the onset of the rainy season and monitoring and maintaining until disturbed areas have stabilized). (Mitigation measure also listed in Geology and Soils Section.)
- If needed, develop temporary retention pond (a vegetated swale, a shallow excavation, or a combination of detaining systems) to contain turbid stormwater during construction at the Port Angeles substation. (Mitigation measure also listed in Geology and Soils Section.)
- Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for short and long-term erosion. (Mitigation measure also listed in Vegetation and Wetlands, Geology and Soils, and Air Quality Sections.)
- Provide appropriate long-term stormwater detention or control facilities at the converter station site as required by the City of Port Angeles. (Mitigation measure also listed in Terrestrial Fish and Wildlife Section.)

3.1.4 Unavoidable Impacts Remaining After Mitigation Measures

Impacts to water quality with all mitigation measures in place would include temporary sedimentation and turbidity in the Strait and Harbor during cable laying work and HDD hole end point excavation, sedimentation from drilling fluid releases into the Harbor at HDD hole end point, and potential re-suspension of contaminants in the Harbor around the Rayonier pulp mill outfall. Operation of the cable in the marine environment would increase water temperatures within 4 inches (10 cm) of the sediment surface or exposed cable by less than 1.8°F (1°C). Terrestrial portions of the project would impact water quality through stormwater increases into waterways during dewatering and terrestrial trenching and long-term increases in stormwater run-off from clearing and development of the converter station and at the BPA Port Angeles Substation.

3.1.5 Environmental Impacts – No Action Alternative

With the No Action Alternative, the project would not be built; therefore there would be ***no*** impacts to water resources due to project construction or operation.

3.2 Vegetation and Wetlands

3.2.1 Affected Environment

3.2.1.1 Threatened and Endangered Plant Species/Special-Status Species

There are no federally-listed threatened or endangered plant species in Clallam County. There are nine state-listed threatened plant species in Clallam County and a number of special status species (see Appendix D for a table listing known occurrences of threatened and endangered and special-status plant species in Clallam County from the Washington Natural Heritage Information System). No special status plant species were observed during field surveys of the converter station site and the Port Angeles Substation expansion area in April 2005.

3.2.1.2 Marine Vegetation

Marine vegetation grows to a depth where light penetration through the water is sufficient for photosynthesis to capture enough energy for plant growth. The lower depth of this photic zone is dependent on water clarity and is generally considered to be between 30 to 100 feet (9 to 30 m) below Mean Lower Low Water (MLLW) in the Puget Sound and the Strait (Williams and Thom 2001).

Dive surveys of the marine vegetation in the Harbor found healthy growth of macroalgae, primarily brown algae such as *Desmarestia*, *Laminaria*, and *Costaria*, growing in the cable corridor from about the HDD hole site to 65 feet (20 m) below the MLLW. It is likely that this algae is present in the cable corridor to a depth of 100 feet (30 m). Below 100 feet there would be insufficient light for plant growth. This depth occurs about 7,170 feet (2185 m) from the shoreline, about 6,065 feet (1849 m) northeastward from the proposed HDD hole end point in Port Angeles Harbor. Beyond this point and out to the U.S./Canadian border, attached marine vegetation would not be encountered because water depths are greater than 100 feet (30 m), exceeding 500 feet (150 m) in some places (see Figure 2-1).

Drifting blades of macroalgae may be encountered, but this material would have originated from plants growing in the photic zone. At this depth, drifting plant material would decay and contribute to detritus.

3.2.1.3 Terrestrial Vegetation

Port Angeles is located within the Puget Lowland physiographic province, in the Olympic Rain-Shadow and falls within the Puget Sound Douglas fir vegetative zone. The native plant community of this zone is characterized by coniferous forests, usually Douglas fir-dominated, in low to mid-elevations on the west side of the Cascade Range and includes Sitka spruce and western hemlock subzones.

The HDD hole construction site, the terrestrial DC cable, and much of the AC cable and fiber cable would be in paved areas with no vegetation. Any staging areas required beyond the converter station site and the Port Angeles Substation expansion area would be in paved or graveled areas without vegetation.

Converter Station Site

The 5-acre (2-ha) converter station property has a mix of vegetation. A little over a third of the site was cleared of trees and vegetation in 2004 for the construction of a steel pole transmission line and is now a field dominated by white clover (*Trifolium repens*) and various grasses. (See Figure 3-2.) This cleared area is on the east side of the property. There is also a tree buffer on this side, outside of the property boundary next to S. Liberty Street. The middle portion of the site has three wood-pole transmission lines crossing the area and is regularly maintained to keep vegetation from growing close enough to the lines to cause outages. The vegetation under the existing lines consists of young red alder (*Alnus rubra*) and Douglas fir (*Pseudotsuga menziesii*) trees about 20 feet (6 m) tall, and lower-growing vegetation of willow (*Salix*), snowberry (*Symphoricarpos albus*), and salal (*Gaultheria shallon*).

A little less than a third of the site is vegetated with relatively mature trees and understory. (See Figure 3-2.) This area is on the west side and consists of a tree mix of Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), western hemlock (*Tsuga heterophylla*), and Indian plum (*Oemleria cerasiformis*). These trees range in height, with the taller trees reaching 70 to 100 feet (21 to 30 m) tall. The under story includes narrowleaf sword fern (*Polystichum imbricans*), common snowberry (*Symphoricarpos albus*), creeping buttercup (*Ranunculus repens*), stinging nettle (*Urtica doica*), salmonberry (*Rubus spectabilis*), and salal (*Gaultheria shallon*).

Scotch broom (*Cytisus scoparius*), a Class B noxious weed in Clallam County, is prevalent along the northern property boundary of the converter station site. In Clallam County, Class B noxious weeds are required to be controlled in pits, borrow pits, or gravel mining areas, and areas within 50 feet (15 m) of them (Lucero 2006). The converter station does not qualify as this type of area. The landowner may have the plant, but may not let it go to seed.

Port Angeles Substation Interconnection Site

Most of the area where the Port Angeles Substation electrical yard would be expanded is open area covered in shrubs, legumes, and grasses, with a few small trees, red alder (*Alnus rubra*), and Scouler's willow (*Salix scouleriana*). The low-growing vegetation includes the following:

- Himalayan Blackberry (*Rubus discolor*),
- Western Brackenfern (*Pteridium aquilinum*),
- Meadow Horsetail (*Equisetum pratense*),
- Common Rush (*Juncus effusus*),
- Tall Fescue (*Fesctuca arundinacea*),

- Tapered Jointed Rush (*Juncus acuminatus*),
- Narrowleaf Sword Fern (*Polystichum imbricans*),
- Common Snowberry (*Symphoricarpos albus*),
- Creeping Buttercup (*Ranunculus repens*),
- Stinging Nettle (*Urtica doica*),
- Salmonberry (*Rubus spectabilis*),
- Common Velvet Grass (*Holcus lanatus*).

The east and west sides of the expansion area are wooded with a mix of conifer and deciduous trees and an understory of shrubs. The east side, next to Peninsula College, consists of Douglas-fir, western hemlock, western red cedar and various hardwoods of various ages including some older red alder. Tree heights reach 77 to 106 feet (23 to 97 m) tall. The understory includes ferns and salal. This wooded area blends with wooded acreage on the college property.

On the west side, along Porter Street, the treed area is a mix of primarily younger hardwoods - red alder, bitter cherry (*Prunus emarginata),* willow, big leaf maple, Indian plum (*Oemleria cerasiformis)* and Pacific ninebark (*Physocarpus capitatus*). A few larger and older trees in this area include maple, cottonwood (*Populus*), Douglas fir, and western red cedar. The under growth includes ferns, snowberry, and salmonberry.

3.2.1.4 Riparian Vegetation and Wetlands

A riparian zone is the interface between land and a flowing surface water body. Plant communities along the river margins are called riparian vegetation and are important for soil stability and maintaining water quality.

Peabody Creek, White Creek, and Ennis Creek are within the project vicinity and have varying amounts of riparian vegetation. However, the creeks are far enough from where the project action would occur that the riparian vegetation would not be affected.

Wetlands are areas of transition between aquatic and terrestrial systems, where water is the dominant factor determining the development of soil characteristics and associated biological communities. They are important communities that have declined over the years due to an increase in agriculture practices and urban development. The Army Corps of Engineers' definition of wetlands includes the presence of three parameters: hydrology, soil type, and vegetation type.

Based on United States Department of Agriculture (USDA) soil types, National Wetland Inventory Maps, historical aerial photos, and City of Port Angeles Critical Area Maps, there are no wetlands identified on the converter station site. No wetland indicator-type vegetation is present in the open area, and it is not expected that the soil type, plants, or hydrology are present in the disturbed area under the transmission lines or in the wooded portion of the site.

Some wet areas were found during a survey on the BPA Port Angeles Substation expansion area. These areas appear to be primarily temporary and to have generally been caused by tire ruts, seasonal runoff, and water collection in low spots. These areas did not meet at least one of the wetland criteria for soil-type, plant-type, or hydrology and thus are not considered to be wetlands.

3.2.2 Environmental Impacts – Proposed Action

3.2.2.1 Marine DC Cable and Horizontal Directional Drill Hole

The portion of the marine DC cable at depths below 100 feet (30 m) would not impact marine vegetation because the conditions of the Strait below this depth do not allow for marine vegetation growth. At depths shallower than 100 feet (30 m), the proposed project would affect marine vegetation.

Marine trenching and work around the HDD hole end point in the Harbor would remove about 5 acres (2 ha) of marine vegetation, primarily brown algae (this acreage assumes a 16-foot [5-m] wide trench in order to bury the cable 12 feet [3.7 m] deep and includes an additional 20 feet [6 m] of disturbance due to burial from sidecast sediments). Marine algae would recolonize provided that appropriate attachment substrate is available. The trenching would not result in the long-term removal of sediment, and the seafloor would not be substantially changed from the pre-project condition; therefore, the marine algae community would likely recover. The marine vegetation would recover within one or two growing seasons (Newell et al., 1998). If concrete mattresses were used within the marine vegetated zone, they would provide additional substrate for algae attachment. Because 5 acres (2 ha) of vegetation would be a small amount of vegetation removed relative to the vegetated sea bed out to depths of 100 feet (30 m) and because vegetation in the affected area would recolonize, impacts would be ***low***.

The HDD hole construction site in the street and the bore hole would be located in pavement and through soil and bedrock and would not impact vegetation. The HDD hole would route under Ennis Creek riparian zones and would not impact riparian vegetation.

3.2.2.2 Terrestrial DC Cable

Because the terrestrial DC cable would be trenched in paved streets, no vegetation would be impacted, including landscaping or yards of adjacent residents.

3.2.2.3 Converter Station

To construct the converter station and associated facilities, an approximate 3.75 acre (1.5 ha) portion of the property would be cleared of vegetation, with vegetative buffers remaining on the east and west property borders (see Figure 3-2). About 1.8 acres (0.7 ha) of grasses and clover would be removed, about 1.3 acres (0.5 ha) of the young trees and shrubs (willow, alder, Douglas fir, snowberry, salal, and Scotch broom) under the existing transmission lines would be removed, and about 1 acre (0.4 ha) of more established tress and undergrowth (fir, cedar, alder maple ferns, snowberry, and salal) on the west side would be removed. A vegetative buffer about 100-foot (30-m) wide would be left along the west side. However, select tall trees growing within this buffer area that would have the potential of falling into the converter station yard would be removed. These trees would most likely be the taller-growing Douglas fir and cedar. The trees growing on the eastern boundary, along S. Liberty Street, are not within the converter station property boundary; however, select trees within this area may also be removed if they too pose a safety hazard to the converter station.

Although this site is relatively isolated, providing a small vegetated space surrounded by development, the amount of vegetation that would be removed would be small, and the vegetation is low-to-moderate quality and not unique to the area.

Scotch broom, a noxious weed on the site, would be removed and landscaping along the property boundaries would help prevent its spread to adjacent properties and mitigate impacts.

Because there are no federally-listed threatened or endangered species in Clallam County and because no state-sensitive plants were found on the site, there would be ***no*** impacts to protected plant species. The impacts from vegetation removal at the converter station site would be ***low***. (Please see Sections 3.4, Terrestrial Wildlife and Freshwater Fish and Wetlands and 3.7, Visual Resources for impacts of vegetation removal on wildlife and visual resources.)

Because no wetlands indicators have been found on the converter station site, wetlands are not expected to be affected; therefore there would be ***no*** impacts to wetlands.

3.2.2.4 Terrestrial AC Cable

The portion of the terrestrial AC cable within Porter Street would not impact vegetation because the cable trenching work would be within the paved road bed. The two options for bringing the cable onto the BPA substation property would require the removal of vegetation, including some tall trees. Either option would require removing about a quarter acre (0.1 ha) of trees. (Option A would require between 0.12 and 0.27 acre [0.04 ha and 0.11 ha] of trees, while Option B would require between 0.17 and 0.25 acre [0.07 and 0.1 ha] of trees removed.) Because the area impacted would be small and does not contain federally- or state-listed species, impacts to vegetation due to the terrestrial AC cable would be ***low***.

Because no wetlands are present, ***no*** wetlands would be impacted.

The fiber cable that would be laid in a trench from Porter Street to the relay house in Port Angeles Substation would disturb the gravel edge of an existing access road. No vegetation would be disturbed.

The fiber cable placed in a bore hole under Park Avenue would not disturb any vegetation. ***No*** impacts to vegetation would occur from construction or operation of the fiber cable.

3.2.2.5 Port Angeles Substation Interconnection

About 3.5 acres (1.4 ha) of trees and about 2 acres (0.8 ha) of grasses and shrubs would be removed for the interconnection work at the Port Angeles Substation (see Figure 3-2).

On the east side of the property about 1 acre (0.4 ha) of about mature Douglas-fir, western hemlock, western red cedar, alder and various other hardwoods would be removed, along with the understory of ferns and salal. This vegetation is of fairly high quality and is connected to the larger forested area on Peninsula College property. Tree removal would take off an edge of this forested area.

Low-growing vegetation would be allowed to remain in this area, though most of this vegetation would be crushed or otherwise adversely affected during clearing activities. Some of the existing low-growing plants under the tree canopy that are shade dependent (e.g., narrow-leaf sword fern) may not survive the exposure to the sun after tree clearing. Sun-tolerant species would either spread or colonize the area. Although no noxious weeds were identified on site, the area would be disturbed and the potential for noxious weeds that may be in the vicinity to colonize this cleared area would be ***high***. Reseeding the area would help lessen this potential.

In the middle of the property, grasses and low-growing shrubs would be removed. This area is disturbed from past substation construction and the use of existing dirt access roads crossing the area; the plants present are low-quality.

On the west side of the BPA property along Porter Street, about 2.4 acres (1 ha) of trees would be removed. This tree mix of mostly younger hardwoods is lower quality than on the east side, though the area does include a few larger maple, firs and cedars. This tree stand is relatively small, isolated from other vegetated spaces, and not unique to the area. As with the east side, low-growing vegetation would be allowed to remain, as well as shorter trees that would not provide a threat of falling or growing close enough to the relocated overhead transmission line to cause an outage. Some existing low-growing plants may not survive exposure to the sun after tree clearing, and more sun-tolerant species may colonize the area, including noxious weeds. Reseeding the area would help lessen the potential for weeds to spread.

Because there are no federally-listed threatened or endangered species in Clallam County and because no state-sensitive plants were found on the site, there would be ***no*** impacts to protected plant species.

Overall, impacts to vegetation at the Port Angeles Substation would be ***low-to-moderate.*** (Please see Sections 3.4 and 3.7 for impacts of vegetation removal on wildlife and visual resources.)

Because no wetlands were found on the Port Angeles Substation project area, there would be ***no*** impacts to wetlands.

3.2.3 Mitigation Measures

- Assess impacts to nearshore habitat at the HDD hole end point and trenching to a depth of 70 feet (21 m) within two weeks after cable installation is completed and again after 1 year during the growing season (June 1 through October 1). If the marine vegetation has not recovered to 80% of the density of adjacent areas within 3 years of monitoring, develop a mitigation plan in consultation with WDFW. (Mitigation measure also listed in Marine Habitat and Wildlife Section.)

- Cut or crush vegetation, rather than blade, in areas that will remain vegetated in order to maximize the ability of plants to resprout. (Mitigation measure also listed in Geology and Soils Section.)
- Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to limit the potential for colonization by noxious weeds. (Mitigation measure also listed in Water Resources, Geology and Soils, and Air Quality Sections.)

3.2.4 Unavoidable Impacts Remaining After Mitigation Measures

Impacts to vegetation with all mitigation measures in place would include the removal of about 5 acres (2 ha) of algae, with expected re-colonization within one to two seasons; and removal of about 3.8 acres (1.5 ha) of grasses, about 1.3 acres (0.5 ha) of young trees and shrubs, and about 4.5 acres (1.8 ha) of trees. In addition select trees, with the potential of causing safety hazards at the converter station, would be removed within the vegetative buffer areas on the east and west sides of the site.

3.2.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create ***no*** impacts to marine or terrestrial vegetation.

3.3 Marine Habitat and Wildlife

3.3.1 Affected Environment

The marine resources that could be found in the area of the Strait and Port Angeles Harbor include:

- Marine Habitat
- Threatened and Endangered Species
- Marine Mammals
- Seabirds
- Sea Turtles
- Fish
- Shellfish

3.3.1.1 Marine Habitat

The shallow banks and deep basins in the central Strait provide habitat for both deep- and shallow-water species (Palsson et al. 2002). The Strait's habitats can be classified as shallow marine-subtidal mixed-fines with moderate to high energy, or deep marine-subtidal mixed-fines with high energy. The shallow habitat type consists of mixed sand and shell that may include gravel or mud. This habitat may have algal populations on bottom pebbles and a diverse infauna (invertebrates living in the sediment). Gulls feed extensively in these shallow areas. The second, deeper habitat type is more stable than its shallow counterpart and supports a fairly diverse infauna (including bivalves, amphipods [small crustaceans], snails, sea cucumbers, and polychaetes [bristle worms]) (Dethier 1990).

Essential Fish Habitat (EFH) is legally defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA 2005c). EFH has been further interpreted as (Holland 2005):

- Aquatic areas and their associated physical, chemical, and biological properties that are used by fish;
- Aquatic areas historically used by fish where appropriate substrate includes sediment, hard bottom, structures underlying the waters, and
- Associated biological communities and habitat necessary to support a sustainable fishery and the managed species' contribution to a healthy ecosystem.

The Port Angeles Harbor and the Strait are marine habitat that is EFH for many species of west coast groundfish, Pacific salmon, and coastal pelagic species.

A variety of marine habitat can be found along the cable corridor including open water and benthic habitat (kelp beds, eelgrass beds, rock, sand, and mud) (City of Port Angeles 1989). The following subsections describe these marine habitats.

Open Water Habitat

Open water habitat within the Harbor and the Strait can be described as a saltwater medium that fluctuates in salinity and temperature. Open water within the project area supports a variety of fish species (see Section 3.3.1.6). This habitat is also the medium for various migrating marine mammals and serves as off-shore feeding areas for seabirds and marine mammals. In addition, open water habitat supports phytoplankton (microscopic plant life) and zooplankton (microscopic animal life including larval stages of fish, crabs, etc.) (City of Port Angeles 1989).

Benthic Habitat

The bottom of a water body is known as the benthos. Organisms living in or on the bottom are described as benthic. Species common to the Strait's benthic habitat are listed in Table 3-2.

Table 3-2 Species Common to the Strait of Juan de Fuca Benthos

Organism Type	Genus and Species Name
Bivalve (e.g., clams, mussels)	*Tellina modesta*
	Macoma expansa
Amphipod (e.g., beach fleas)	*Rhepoxynius abronius*
	Foxiphalus obtusidens
	Eohaustorius washingtonianus
	Monoculodes spinipes
Gastropod (e.g., marine snails)	*Buccinum plectrum*
	Neptunea lyrata
	Antiplanes thalea
Ophiuroid (e.g., sea cucumbers)	*Ophiura* spp.
Polychaete (e.g., marine worms)	*Chaetozone setosa*
	Maldane glebifex
Source: Dethier 1990.	

In 1999, a study evaluated the health of the benthic macroinvertebrate community of Port Angeles Harbor. Wood waste covered about 25 percent of the bottom of Port Angeles Harbor, primarily in the log booming areas. Epibenthic (*on* top of the sediment) organisms (e.g., shrimp, crabs, fish, etc.) were in the wood waste areas. Benthic organisms can be described by stages (I, II, and III) in which they will inhabit an area after a disturbance (i.e., Stage I organisms move in first). Stage III organisms were present in most of the off-shore areas of the central harbor. The infaunal community (organisms living *in* the sediment) in most areas of Port Angeles Harbor consisted of small surface feeding or filtering Stage I organisms (e.g., polychaetes and snails) and larger head-down Stage III deposit feeders (e.g., burrowing bivalves). Infaunal stages could not be determined near the Rayonier pulp mill site due to the hard, rocky substrate and other field conditions that limited access with underwater gear. However, most of Port Angeles Harbor was considered to have healthy and undisturbed benthic conditions (SAIC 1999).

The following are various types of benthic habitats that exist within the vicinity of the marine portions of the proposed project.

<u>Kelp and Algae</u>

Kelp (macroalgae) habitats in Washington are classified as a critical habitat for a number of federally listed, federally proposed, and declining stocks (e.g., sea otters, pinnipeds, salmon, etc.). The Strait supports the majority of kelp resources in Washington. Despite its importance, little information exists on kelp habitat community structure in the Strait (Shaffer 2000). Kelp beds are found along at least 40 percent of the Strait's shore. Attached, as well as drifting, kelp supports complex nearshore assemblages of fish and algal life (Shaffer 2001). Juvenile salmon and surf smelt appear to preferentially use kelp bed habitat over unvegetated areas (Shaffer 2003). Juvenile rockfish use drifting kelp to hide from predators until they are large enough to relocate to rocky habitats (Shaffer 2001). Floating kelp (i.e., kelp with float-like structures in its upper portion) provides multi-canopied habitats for abalone, crabs, salmon, rockfish, herring, and ling cod (Mumford, Berry, and von Wagonen 1998). Kelp also provides nutrition to grazers such as sea urchins, abalone, snails, and chitons (Iken 2005).

As described in Section 3.2.1.2, Marine Vegetation, kelp and algae habitat is found around the HDD hole end point and along the cable corridor, likely out to a depth of 100 feet (30 m) which is about 2,020 yards (1850 m) from the HDD hole end point. Beyond this depth, there is not enough light penetration into the ocean to support plant growth.

<u>Eelgrass Beds</u>

Eelgrass provides food production and physical structure for the biological community, and is nursery habitat for many commercial fisheries species (Murphy, Johnson, and Csepp 2000). Eelgrass is the main food item for certain waterfowl species (i.e., black brant and Canada goose), snails, and green urchins (PTMSC 2005).

Eelgrass is considered EFH. Eelgrass is the primary spawning substrate for Pacific herring (Pentilla 2001), is used extensively by juvenile salmonids and rockfish for foraging, and is used by small forage fish species for migration and feeding (Shaffer 2001). Because of its value as fish habitat, eelgrass beds are legally defined as *Special Aquatic Sites* for protection in coastal zone management (Murphy, Johnson, and Csepp 2000). The native eelgrass *Zostera marina* is generally found between the depths of 0 ft to about -15 to -20 ft (-4.5 to -6 m) depending on water clarity.

The WDFW Priority Habitats and Species data does not show any large eelgrass concentrations in the project vicinity (WDFW 2005) (see Figure 3-3). During a dive survey on May 29, 2005, a patchy bed of eelgrass was observed about 0.3 miles (0.5 km) to the east of the proposed cable route. No eelgrass was observed near the proposed HDD hole end point or along the cable corridor during the dive survey on May 29, 2005, nor was any observed during a diver survey in September 2005. This result is not surprising since the HDD hole end point would be in 26-foot (8-m) deep water and eel grass only grows up to 20 foot (6 m) depths, which would be about 260 to 360 feet (80 to 110 m) inshore from the HDD hole end point.

Rock

Nearshore rocky reefs are made up of various rock formations such as flat rock, vertical/angular bedrock, boulders of all sizes, cobble, gravel, and sand patches. This diverse bottom topography creates micro-environments that serve as important habitats for invertebrates, fish, and algae (HMSC 2005). Rock habitat is especially important to all species of rockfish (Palsson 2001). Other fish species use rocky areas for cover from predators and refuge from the current. The hard surface of rocks is important for egg attachment and recruitment of sessile (non-mobile) animals like sponges and tunicates (sea squirts) (Auster and DeGoursey 2001). Rock areas that are exposed at low tide provide wetted habitat (i.e., tidal pools) for many invertebrates and algae that would otherwise desiccate (dry out) and die from air exposure.

No rocky reef habitat was observed from the HDD drill hole end point out to -65 feet (-20 m). Deep Sonar data indicates that there is a sediment layer of about 3 feet (1 m) along the corridor across the Strait, with little to no exposed rocky bottom.

Sand and Mud

Sand habitats are usually considered to be lower in complexity when compared to other habitat types. While sand habitats do not support a wide array of life, some species do depend on sand for cover (i.e., protection) and spawning areas. Crabs, flounders, and some species of clams use sand habitats for cover. The unconsolidated nature of sand provides easy burial for camouflaging purposes (Auster and DeGoursey 2001). Sand is also an important spawning habitat for some species of forage fish. Pacific sand lance, an important salmon prey item, spawns in the upper intertidal sand at high tide. Surf smelt use sandy gravel areas on intertidal beaches to spawn (Penttila 2001). The beach and intertidal zone overlying the proposed cable HDD hole route is composed of small cobbles, gravel, and sand.

The area from the HDD hole end point, at a depth of about 26 to 30 feet (8 to 9 m), out to about 65 feet (20 m) is fairly homogeneous with silt and sand occasionally mixed with gravel.

Sand waves are naturally-occurring seafloor sediment features that resemble sand dunes. The bathymetry and surficial geology mapping (see Appendix C) of the cable route indicates large sand waves (13 to 33 feet [4 to 10 m]) where the cable crosses into the U.S. and smaller sand waves northeast of Ediz Hook. Throughout the rest of the route in the U.S., there are segments of sand waves of varying heights.

Mud habitats are usually made up of fine sand, silt, and clay. These habitats are productive and diverse. Mud is an important substrate for oyster beds, clam burrows, and other invertebrates such as shrimp and worms. Mud habitats (called mud flats at low tide) also provide substantial food resources for shorebirds and fish (City of Port Angeles 1989). This habitat is found in the Harbor.

3.3.1.2 Federal and State Protected Marine Species and Habitat

The Endangered Species Act (ESA) of 1973, as amended, protects species that are listed as endangered or threatened, or proposed for listing. Pursuant to the act, a federal agency must consult with the appropriate federal agency (United States Fish and Wildlife Service or National Oceanic and Atmospheric Administration) to ensure that its actions will not jeopardize the continued existence of the listed species. Thirteen ESA-listed wildlife species with known occurrences in the marine environment of Clallam County have been identified (see Table 3-3). Section 3.4 discusses terrestrial ESA-listed species.

WDFW maintains a list of species and habitats that the state considers priority for protective management. These include state endangered, threatened, or sensitive species (as well as candidates for these listings), animal aggregations considered vulnerable, and species of recreational, commercial or tribal importance that are vulnerable. The marine species and habitats in the project area that fall into these categories for protection include two habitats, nine mammals, nine seabirds and two seabird concentration areas, four marine turtles, 29 fish, and 11 shellfish. Please see Table 3-3 for a list of federal and state protected species. Figure 3-3 shows known state priority habitats and species in the project vicinity, including clams, crab, geoduck, urchins, water fowl concentrations, harbor seals, eelgrass meadows, common loon, seabirds, and seal haul-out locations.

Table 3-3 Protected Marine Species and Habitat

Species[1]	State Status[2]	Federal Status[2]	Possibly Present in Project Vicinity
Habitats			
Marine / Estuarine Shorelines	Priority Habitat	None	Yes
Vegetated Marine / Estuarine	Priority Habitat	None	Yes
Mammals			
Sea Otter (*Enhydra lutris*)	E	FCo	Yes
Pacific Harbor Porpoise (*Phocoena phocoena*)	SC	None	Yes
Dall's Porpoise (*Phocoenoides dalli*)	PS	None	Yes
California Sea Lion (*Zalophus californianus*)	PS	None	Yes
Steller Sea Lion (*Eumetopias jubatus*) [3]	T	T	Yes
Harbor Seal (*Phoca vitulina*)	PS	None	Yes
Gray Whale (*Eschrichtius robustus*)	SS	None	May occur
Southern Resident Killer Whale (*Orcinus orca*)	E	E	Yes
Humpback Whale (*Megaptera novaeangliae*)	E	E	May occur
Sea Birds			
Brandt's cormorant (*Phalacrocorax penicillatus*)	SC	None	Yes
Brant (*Branta bernicla*)	PS – game species	None	Yes
Brown Pelican (*Pelecanus occidentalis*)[3]	E	E	Unlikely
Cassin's auklet (*Ptychoramphus aleuticus*)	SC	FCo	Unlikely
Common murre (*Uria aalge*)	SC	None	May occur
Marbled Murrelet (*Brachyramphus marmoratus*) [3]	T	T	May occur
Short-Tailed Albatross (*Phoebastria albatrus*) [3]	SC	E	Unlikely
Snowy plover (*Charadrius alexandrinus*)	E	T	Unlikely
Tufted puffin (*Fratercula cirrhata*)	SC	FCo	May occur
Western Washington breeding concentrations of:	PS - Breeding areas	None	Unlikely

Table 3-3 Protected Marine Species and Habitat

Species[1]	State Status[2]	Federal Status[2]	Possibly Present in Project Vicinity
Alcids, Cormorants, Storm-petrels, and Terns			
Western Washington nonbreeding concentrations of: Alcids, Charadriidae, Cormorants, Fulmar, Grebes, Loons, Phalaropodidae, Scolopacidae, Shearwaters, Storm-petrels	PS – Regular, large concentrations	None	May occur
Turtles			
Green Sea Turtle (*Chelonia mydas*)	T	T	Unlikely
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)	None	T	Unlikely
Leatherback Sea Turtle (*Dermochelys coriacea*)	E	E	Unlikely
Loggerhead Sea Turtle (*Caretta caretta*)	T	T	Unlikely
Fish			
Puget Sound ESU[4] Chinook Salmon (*Oncorhynchus tshawytscha*) [3]	SC – food fish	T	Yes
Hood Canal Summer-Run Chum Salmon (*Oncorhynchus keta*) [3]	SC – food fish	T	Yes
Puget Sound Steelhead *(Oncorhynchus mykiss)*	None	PT	Yes
Coastal Resident / Searun Cutthroat (*Oncorhynchus clarki clarki*)	PS - game	None	Yes
Pacific Herring (*Clupea pallasi*)	SC	None	Yes
Eulachon (*Thaleichthys pacificus*)	SC	FC	Yes
Longfin Smelt (*Spirinchus thaleichthys*)	PS – food fish	None	Yes
Surfsmelt (*Hypomesus pretiosus*)	PS – food fish	None	Yes
Pacific Cod (*Gadus macrocephalus*)	SC – food fish	None	Yes
Pacific Hake (*Merluccius productus*)	SC – food fish	None	Yes
Walleye Pollock (*Theragra chalcogramma*)	SC – food fish	None	Yes
Black Rockfish (*Sebastes melanops*)	SC – food fish	None	Yes
Bocaccio Rockfish (*Sebastes paucispinis*)	SC – food fish	None	Yes
Brown Rockfish (*Sebastes auriculatus*)	SC – food fish	FCo	Yes

Table 3-3 Protected Marine Species and Habitat

Species[1]	State Status[2]	Federal Status[2]	Possibly Present in Project Vicinity
Canary Rockfish (*Sebastes pinniger*)	SC – food fish	None	Yes
China Rockfish (*Sebastes nebulosus*)	SC – food fish	None	Yes
Copper Rockfish (*Sebastes caurinus*)	SC – food fish	FCo	Yes
Greenstriped Rockfish (*Sebastes elongates)*	SC – food fish	None	May occur
Quillback Rockfish (*Sebastes maliger*)	SC – food fish	FCo	Yes
Redstripe Rockfish (*Sebastes proriger*)	SC – food fish	None	May occur
Tiger Rockfish (*Sebastes nigrocinctus*)	SC – food fish	None	Yes
Widow Rockfish (*Sebastes entomelas*)	SC – food fish	None	Yes
Yelloweye Rockfish (*Sebastes ruberrimus*)	SC – food fish	None	Yes
Yellowtail Rockfish (*Sebastes flavidus*)	SC – food fish	None	Unlikely
Lingcod (*Ophiodon elongates*)	PS – food fish	None	Yes
Pacific Sand Lance (*Ammodytes hexapterus*)	PS – food fish	None	Yes
English Sole (*Parophyrs vetulus*)	PS – food fish	None	May occur
Rock Sole (*Lepidopsetta bilineata*)	PS – food fish	None	May occur
Shellfish			
Newcomb's Littorine Snail (*Algamorda subrotundata)*	SC	FCo	Yes
Pinto (Northern) abalone (*Haliotis kamtschatkana)*	SC	FC	Yes
Butter clam (*Saxidomus giganteus)*	PS – shellfish	None	Yes
Geoduck clam (*Panopea abrupta)*	PS – shellfish	None	Yes
Japanese littleneck clam (*Tapes philippinarum)*	PS – shellfish	None	Yes
Littleneck clam (*Littleneck clam*)	PS – shellfish	None	Yes
Olympia oyster (*Ostrea lurida)*	SC	None	May occur
Pacific oyster (*Crassostrea gigas)*	PS – shellfish	None	Yes

Table 3-3 Protected Marine Species and Habitat

Species[1]	State Status[2]	Federal Status[2]	Possibly Present in Project Vicinity
Razor clam (*Siliqua patula)*	PS – shellfish	None	Yes
Dungeness crab (*Cancer magister)*	PS – shellfish	None	Yes
Pandalid shrimp (Pandalidae) (*Pandalus spp.)*	PS – shellfish	None	Yes

1. List from WDFW: http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/hab/phslist.htm
2. Status: Endangered (E), Threatened (T), Proposed Threatened (PT), Federal Candidate (FC), Federal Species of Concern (FCo), State Candidate (SC), State Sensitive (SS), Priority Species (PS).
3. Species also ESA-listed.

3.3.1.3 Marine Mammals

Various marine mammals occupy the trans-boundary waters of the Strait. Table 3-4 shows the marine mammal species that may occur in the project area. Of these species, the Steller sea lion, killer whale, and humpback whale are listed under the ESA. A description of each species identified in Table 3-4 follows.

Table 3-4 Marine Mammal Species That May Occur in the Project Area

Common Name	Scientific Name
Harbor Seal	*Phoca vitulina richardsi*
Northern Elephant Seal	*Mirounga angustirostris*
California Sea Lion	*Zalophus californianus*
Steller Sea Lion[1]	*Eumetopias jubatus*
Harbor Porpoise	*Phocoena phocoena*
Dall's Porpoise	*Phocoenoides dalli*
Killer Whale[1]	*Orcinus orca*
Gray Whale	*Eschrictius robustus*
Humpback Whale[1]	*Megaptera novaeangliae*
Minke Whale	*Balaenoptera acutorostrata*
Sea Otter[2]	*Enhydra lutris*

[1] ESA-listed marine species
[2] The sea otter has no formal ESA federal designation. However, it is listed as endangered by the state of Washington (NOAA 1995).

Harbor Seal (Phoca vitulina richardsi)

The harbor seal is found throughout the temperate and arctic waters of the northern hemisphere and has the widest distribution of any pinniped. It breeds and feeds in the same area throughout the year and is considered a non-migratory species. The harbor seal is the most common pinniped in Washington waters (Jeffries et al. 2000).

Males and females are similar in size, up to 250 pounds (113 kilograms), and coloration. Females reach sexual maturity between 4 years and 5 years and produce one pup per year. Pupping season along the Olympic Peninsula coast is from May through July (Jeffries et al. 2000).

Harbor seals consume a wide variety of fishes, cephalopods, and crustaceans in both estuarine and marine waters (Sease 1992). Pitcher (1980) reported that harbor seals feed on many fish species from a variety of families, including *Gadidae* (cods), *Clupeidae* (herring), *Cottidae* (sculpins), *Pleuronectidae* (righteye flounders), *Salmonidae* (salmon and trout), and *Osmeridae* (smelt).

In 2003, the Washington Inland Stock's (i.e., Strait of Juan de Fuca/San Juan Islands) minimum population of harbor seals was 12,844 (NOAA 2003a). Average annual counts of the Strait of Juan de Fuca region stock (a sub-stock of the Washington Inland Stock) in 1999 were 1,752 individuals (Huber and Laake 2002). Seasonally, group sizes typically range from low numbers of animals on intertidal rocks to several thousand in estuaries. In Port Angeles Harbor, two known harbor seal haulouts (i.e., sites where seals come ashore) are west of the project area. The log booms off the Rayonier pulp mill site and the log booms on the inside of Ediz Hook serve as two haulout locations. The mill site log booms are about 1,245 feet (379 m) from the cable corridor and the Ediz Hook log booms are about 2 miles (3.2 km) from the cable corridor. These sites are within the project vicinity. However, these sites are designated as low-use areas since fewer than 100 harbor seal individuals use these locations (Jeffries et al. 2000).

Northern Elephant Seal (*Mirounga angustirostris*)

Northern elephant seals migrate twice a year from California and Mexico to their northern Pacific Ocean feeding areas. Migration occurs after the winter breeding season and also after the annual summer molt cycle. Adult males feed in the Gulf of Alaska and along the eastern Aleutian Islands, while adult females feed farther south (between 40-45°N latitude) in deep off-shore waters (Seal Conservation Society 2005).

Northern elephant seals are the largest pinniped found in northwest Pacific Ocean waters. The large adult males can weigh more than 2,000 pounds (907 kg) and are readily identified by a large, inflatable proboscis (a flexible, elongated snout). Females are considerably smaller (up to 1,000 pounds [454 kg]) and lack the inflatable proboscis. Breeding rookeries are located on the beaches and islands of California and Mexico (Jeffries et al. 2000).

Solitary individuals can be seen occasionally in Washington marine waters. A few individuals have been noted at Destruction, Protection, and Smith/Minor Islands as well as at Dungeness Spit (see Figure 3-1). The elephant seal population has rebounded from near-extinction levels to well over 100,000 individuals (Jeffries et al. 2000). The U.S./B.C. Strait trans-boundary area is used to feed and haul out. Only one site in the trans-boundary area has been identified as a regular haulout site for northern elephant seals. This area is known as Race Rocks and is at the southern tip of Vancouver Island, B.C. (Calambokidis and Baird 1994). Information taken from Washington Department of Fish and Wildlife Priority Habitats and Species data suggests that the sea haulout areas in the project vicinity (described in harbor seal section above) are used by northern elephant seals; however, survey data taken from the *Atlas of Seal and Sea Lion Haulout Sites in Washington* suggest this site is primarily used by harbor seals and not northern elephant seals (WDFW 2005; Jeffries et al. 2000).

California Sea Lion (*Zalophus californianus*)

Male California sea lions migrate from southern California waters into the northwestern Pacific Ocean during their non-breeding months. Peak numbers of 3,000 to 5,000 animals move into the waters of Washington and B.C. during the fall and remain until the late spring when most of the population then returns to the breeding rookeries in California and Mexico (Jeffries et al. 2000).

All age classes of males are present in the Washington area, with animals ranging from 200 to 1,000 pounds (91 to 454 kg). Coloration of males is usually a dark or chocolate brown. The bleached-out high forehead, or sagittal crest, is distinctive in adult males. California sea lion vocalizations are described as barking (Jeffries et al. 2000).

California sea lions use haulout sites found along Washington's outer coast, the Strait, and Puget Sound. Haulout sites consist of jetties, off-shore rocks, islands, log booms, marina docks, and navigation buoys. This species may also be seen resting in the water (rafted) together in Puget Sound (Jeffries et al. 2000). Information taken from WDFW Priority Habitats and Species data suggests the sea haulout areas in the project vicinity (described in harbor seal section above) are used by California sea lions; however, background research suggests that this site is primarily used by harbor seals and not California sea lions (WDFW 2005; Jeffries et al. 2000).

Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions live and breed in Northwest waters. In Washington, Steller sea lion numbers vary seasonally with peak counts of 1,000 animals present during the fall and winter months. Over its range, Steller sea lion populations have declined significantly over the last 15 years. The species is currently listed as threatened in Washington under the ESA (Jeffries et al. 2000).

Both sexes are found in Washington waters, with males considerably larger (up to 2,200 pounds [998 kg]) than females (up to 700 pounds [318 kg]). Coloration varies from tawny, yellowish-brown, to dark brown. Adult male vocalizations are described as a deep growling sound (Jeffries et al. 2000).

Washington haulout sites are primarily along the outer coast from the Columbia River to Cape Flattery and also along the Vancouver Island side of the Strait. Haulout sites are primarily on jetties, off-shore rocks, and coastal islands, with occasional sites on navigation buoys in Puget Sound. Breeding rookeries are located along the Oregon and B.C. coasts, with no breeding rookeries found in Washington (Jeffries et al. 2000). Information taken from WDFW Priority

Habitats and Species data identified the seal haulout area at the Rayonier mill; although this site is primarily used by harbor seals, it has been documented as being used by Steller sea lions (WDFW 2005; Jeffries et al. 2000).

<u>Harbor Porpoise (*Phocoena phocoena*)</u>

Harbor porpoises typically feed on small schooling fish and squid. Harbor porpoises generally travel in small groups of one to eight individuals. This species tends to avoid boats and is considered to be shy (Baird 2003).

Harbor porpoises are common in coastal waters of the North Pacific and occur year-round and breed in the U.S./B.C. trans-boundary area waters. In general, harbor porpoises are dark gray to black on the dorsal (backside) surface and white on the ventral (belly-side) surface. There are no differences in coloration between males and females. Breeding is seasonal and varies depending on stock location (Baird 2003).

Little information exists on harbor porpoise movement and stock structure in the trans-boundary area (Calambokidis and Baird 1994). However, the Inland Washington Stock population has been assessed by NOAA's Fisheries Service. The Washington Inland Waters stock minimum population is estimated at 2,545 animals (NOAA 2003b).

<u>Dall's Porpoise (*Phocoenoides dalli*)</u>

Dall's porpoise is black with white markings. Though the color pattern varies with individual animals, most are black on the upper portions of the body, with large, white, oval-shaped markings on the sides. The ventral portion of the animal is completely white (ACS 2005).

Dall's porpoises typically feed on squid and small schooling fish. This species generally travels in groups of 10 to 20 individuals. Dall's porpoises are considered to be elusive (ACS 2005). Only a limited amount of research has been conducted on this species in the trans-boundary area. The degree of movement of Dall's porpoises in the trans-boundary area is unknown (Calambokidis and Baird 1994).

Dall's porpoises occur year-round in the U.S./B.C. trans-boundary waters. This species is widely distributed throughout the North Pacific (Calambokidis and Baird 1994). Minimum population sizes for the Pacific Region (includes California, Oregon, and Washington) are 75,915 individuals (NOAA 2003c). Estimated abundances for the Strait in the 1990s were 3,015 animals (Calambokidis and Baird 1994).

<u>Killer Whale (*Orcinus orca*)</u>

The killer whale has a robust black and white body with gray to white saddle markings behind the dorsal fin. Killer whales are considered the most widespread cetacean with regard to range. These animals normally travel in groups of two to nine related individuals. A number of groups that spend much of their time together constitute a pod. The largest pod in the Washington/ B.C. area contains close to 60 individuals. Killer whale diets range from schooling fish and squid to seals and even other whales (Reeves et al. 2002).

There are two distinct populations of killer whales found in the U.S./B.C. trans-boundary area of the Strait. These populations can be discriminated based on diet. The transient killer whales feed primarily on marine mammal prey (mostly harbor seals). The resident killer whales feed primarily on fish prey (Calambokidis and Baird 1994).

Both residents and transients are seen year-round and breed within the trans-boundary area. Both populations have long-ranging movements and regularly leave the trans-boundary area. Resident killer whales appear to be subdivided into two distinct populations in B.C. Only one of these populations crosses the international border into Washington waters. This population is identified as the "southern resident" population (Calambokidis and Baird 1994). The minimum population number for the southern resident killer whale (also called Puget Sound killer whale) is an estimated 83 individuals, and is currently listed by NOAA Fisheries Service as endangered under the ESA (NOAA 2004a, 2005b). There are three southern resident killer whale pods that since the late 1990s have spent much of the year (7 months or more) in the inland marine waters of Washington, U.S., and B.C., Canada.

The population size for transient killer whales in Washington/B.C. waters is unknown, but numbers at least 160 animals (Calambokidis and Baird 1994).

Gray Whale (*Eschrictius robustus*)

The gray whale has mottled coloration and feeds using baleen plates instead of teeth. This species uses baleen as a sieve to filter food from bottom sediments. Gray whales frequently travel alone when not breeding or feeding. This species has been known to exhibit curiosity toward boats. The gray whale makes an extremely long annual migration, traveling some 5,000 miles (8,000 km) from its northern summer feeding grounds to winter calving areas in warm water (Reeves et al. 2002).

Over 20,000 gray whales migrate past the Strait while moving between their breeding grounds in Baja, Mexico and their primary feeding grounds in the Bering Sea (Calambokidis and Baird 1994). Since its protection in 1946, the eastern Pacific stock of gray whales has made a strong recovery and is now close to its historical abundance. In 1994, the eastern Pacific gray whale was one of the first species to be removed from the ESA list of endangered and threatened wildlife (Gerber, DeMaster, and Kareiva 1999). In 2002, the minimum population estimate for the eastern north Pacific stock was 24,477 (NOAA 2002).

During and following the gray whale migration in the spring, a small number of individuals enter the U.S./B.C. trans-boundary area and spend extensive time feeding. Throughout the trans-boundary area, gray whales primarily use shallow areas close to shore for feeding (Calambokidis and Baird 1994). Information taken from WDFW Priority Habitats and Species data suggests that no known gray whale feeding areas are within the project vicinity (WDFW 2005). Although the 1989 Port Angeles Harbor Resource Management Plan states that gray whales have been observed during various times of the year, "the Harbor is not considered an important biological area for marine mammals" (City of Port Angeles 1989).

Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is a baleen whale that has a black body, white underside, and extremely long flippers. This species is typically seen traveling alone or in small, unstable groups. Humpback whales feed on krill and a variety of small schooling fish. This species migration is the most distant of any mammal, with some whales making a round-trip journey of 10,000 miles (16,000 km) from their summer feeding areas in higher latitudes to mating and calving grounds in tropical latitudes. Humpback whales are found in all major oceans (Reeves et al. 2002).

Humpback whales were once considered common to the U.S./B.C. Strait of Juan de Fuca trans-boundary area including the Puget Sound and the Strait of Georgia. Historical catch data shows several thousands of whales killed from whaling stations on the coasts of Vancouver Island and Washington State. Humpback whales are currently recognized by NOAA Fisheries as endangered under the ESA listing for the Washington coast (including Clallum County) (NOAA 2005b). Sightings in the trans-boundary area are now uncommon, although a few humpback whales have entered and spent prolonged periods in these waters in recent years. Humpback whales are regularly seen during the summer months at the mouth of the Strait in Swiftsure Bank (Calambokidis and Baird 1994). One individual was observed during the marine geophysical survey in July 2005. The whale exhibited feeding behavior north of Constance Bank in the Strait (see Figure 3-1). The 2004 minimum population estimate of the eastern north Pacific stock of humpback whales was 943 individuals (NOAA 2004b).

Minke Whale (*Balaenoptera acutorostrata*)

Minke whales are small, sleek, baleen whales that have a black to dark gray body. This species is the most abundant type of baleen whale worldwide. Minke whales are often seen either alone or in small groups and have been known to approach boats out of curiosity. Very little is documented on the breeding habits of minke whales. It is known however, that this species feeds on a variety of small schooling fish including herring, capelin, and sand lance (Reeves et al. 2002).

These whales are seen year-round, especially from March through November, in the U.S./B.C. trans-boundary area. The trans-boundary area appears to function primarily for feeding. In the Strait area, juvenile herring and juvenile sand lance have been identified as prey items (Calambokidis and Baird 1994).

Minke whales appear to be more common around the San Juan Islands than in other parts of the trans-boundary area. Population size and trends in the Strait remain largely unknown (Calambokidis and Baird 1994). However, it is believed that minke whales in the inland marine waters of Washington do establish home ranges. The whales in Washington’s coastal waters (including Puget Sound) appear behaviorally distinct from migratory whales further north and thus are considered a separate stock. Using 1996 and 2001 ship survey data, the minimum population for minke whales found off the coasts of California, Oregon, and Washington was about 585. Two minke whales were seen during 1996 aerial surveys of Washington/B.C. inland marine waters, but no abundance estimates are available for this specific area (NOAA 2003d). Although no specific data exists concerning trends and abundance in the Strait, scientific literature suggests that this species is primarily found near the San Juan Islands and is not common in the project area.

Sea Otter (*Enhydra lutris*)

Washington's sea otter population was hunted to extinction in the early 1900s. In 1969 and 1970, sea otter Washington Inland Stock were restored to the Washington coast by translocation of a group of animals from Alaska. The translocated population remained small through the 1970s, but since the early 1980s the population has grown significantly. Today, the Washington state population numbers about 600 (VanBlaricom, Carter, and Gerber 2001). The sea otter has no formal federal designation, however it is designated as endangered by the state of Washington (NOAA 1995).

Sea otters are the largest members of the *Mustelidae* family (e.g., minks, weasels, etc.), but are the smallest marine mammals in the north Pacific. The sea otter pelage (i.e., coat) color ranges from dark brown to reddish brown. On average sexual maturity begins at 5 years. Sea otters tend to establish home ranges until the area population density forces individuals (usually males) to move into a new territory (Richardson and Allen 2000).

The current sea otter range in Washington is from Destruction Island to Pillar Point (Richardson and Allen 2000), about 30 miles (48 km) from the cable corridor (see Figure 3-1). Since 1995 the population has been expanding eastward into the Strait (VanBlaricom, Carter, and Gerber 2001). There have been a few isolated sea otter sightings in recent years in the eastern Strait of Juan de Fuca, the San Juan Islands, and within Puget Sound near Olympia. Though the waters in and around the Port Angeles Harbor have not been systematically studied, there have been no known sightings of sea otters in the area (Richardson and Allen, 2000). Therefore, although the population is expanding into the Strait, it is highly unlikely that any animals are in the vicinity of the project area.

3.3.1.4 Seabirds

This subsection describes the marine bird community of Port Angeles Harbor and the project area on the U.S. side of the Strait. The Harbor side of Ediz Hook has regular large concentrations of shorebirds. The bluff along Port Angeles Harbor also provides shorebird habitat (City of Port Angeles 2004). Floating log rafts in the Harbor provide roosting sites for many shorebirds, gulls, and other avian species. Shorebirds using rock habitats are the most common bird group in the Harbor (OPAS 2005). Wintering bird populations in the inner marine waters of Washington tend to be much higher than the summer breeding populations. Species diversity also increases greatly during the winter (Mahaffy et al. 1994). Table 3-5 lists the marine bird species that may occur in the project area.

Table 3-5 Marine Bird Species that May Occur in the Project Area

Barrow's Goldeneye	*Bucephala islandica*
Black-Bellied Plover	*Pluvialis squatarola*
Brown Pelican	*Pelecanus occidentalis*
Common Murre	*Uria aalge*
Golden Plover	*Pluvialis* spp.
Harlequin Duck[1]	*Histrionicus histrionicus*
Heermann's Gull	*Larus heermanni*
Marbled Murrelet[2]	*Brachyramphus marmoratus*
Resident Canada Geese[1]	*Branta Canadensis*
Rhinoceros Auklet	*Cerorhinca monocerata*
Rock Sandpiper	*Calidris ptilocnemis*
Short-tailed Albatross	*Phoebastria albatrus*
Surfbird	*Aphriza virgata*
Thayer's Gull	*Larus thayeri*
Turnstones	*Arenaria* spp.
Wandering Tattler	*Heteroscelus incanus*
Whimbrel	*Numenius phaeopus*

[1]Denotes species that are not technically considered marine birds but do use the shore area.
[2]Denotes ESA-listed species.
Source: (OPAS 2005)

ESA-Listed Seabirds in Clallam County

Three of the marine birds present in Clallam County are ESA-listed species. These birds are the marbled murrelet (*Brachyramphus marmoratus*), short-tailed albatross (*Phoebastria albatrus*), and brown pelican (*Pelecanus occidentalis*). As described more fully below, the short-tailed albatross and brown pelican are believed to occur only along Clallam County's Pacific Ocean coastline and are unlikely to occur in the project area. The marbled murrelet, however, likely occurs in the project vicinity.

Marbled Murrelet (*Brachyramphus marmoratus*)

Marbled murrelets are listed as threatened under the ESA. Marbled murrelets are year-round residents on Washington's marine waters. These birds forage in sheltered waterways and harbors generally within 1.2 miles (1.9 km) of shore, selecting feeding areas that are closer to shore than other alcid (web-footed, diving) seabirds that forage in Washington's waters (Rodick and Milner 1991). Pacific sand lance (*Ammodytes hexapterus)* is the primary prey species of the marbled murrelet, constituting over 65 percent of their diet (Burkett 1995). Other prey species include Pacific herring *(Clupea harengus)*, seaperch *(Cymatogaster aggregata)*, euphausiids, and other marine invertebrates (Burkett 1995).

Areas of winter concentration include the southern and eastern end of the Strait, near Sequim, Washington (Clallam County). During the breeding season they are present along almost all of Washington's marine shoreline, concentrated in areas with abundant food and nearby nesting habitat. These areas of concentration include Tongue Point on the Olympic Peninsula (OPAS 2005). Marbled murrelets nest in mature and old-growth forests within 60 miles of marine waters. The breeding season extends from April 1 to September 15. There are no known marbled murrelet nest sites or potential murrelet-nesting habitat within the project area (WDFW 2005). WDFW Priority Habitats and Species data documents a seabird concentration area about 0.5 mile (0.8 km) west of the project area (WDFW 2005). Although not specifically identified, it is possible that marbled murrelets may feed in the marine waters along the proposed cable corridor.

Short-Tailed Albatross (*Phoebastria albatrus*)

The short-tailed albatross is listed as endangered under the ESA for Clallam County. This species spends most of its life gliding over the northern Pacific Ocean and the Bering Sea, returning to its nesting grounds on the Japanese island of Torishima to breed. Short-tailed albatross sightings are rare. A commercial bird-watching vessel noted only three short-tailed albatross sightings in Washington waters (on the Pacific Coast) from 1993 to 2004 (The Bird Guide, Inc. 2005). Since 1991, periodic sightings have been recorded during off-shore surveys off the coast of B.C. However, these sightings were restricted to the Pacific coast and not within the Strait (COSEWIC 2003). Since historical sightings of the short-tailed albatross are limited to Pacific Ocean coastal waters, it is highly unlikely that this species would occur within the project vicinity.

Brown Pelican (*Pelecanus occidentalis*)

The brown pelican is listed as endangered under the ESA. While it is included in the Clallam County ESA species list, its range is usually limited to the Pacific coast, with occasional sightings in the Strait (OPAS 2005). It is unlikely that this species will occur in the project vicinity.

3.3.1.5 Sea Turtles

Four species of ESA-listed sea turtles are recognized in Clallam County: green sea turtle (*Chelonia mydas*), Olive Ridley (*Lepidochelys olivacea*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*). The U.S. Fish and Wildlife Service Western Washington Office states that these turtle species *may* occur along the *outer* coast in Clallam County (USFWS 2005). Since the sea turtle range does not include inland marine waters of Washington, including the Strait, these animals are not expected to occur within the project vicinity.

3.3.1.6 Marine Fish

The Strait and its harbors support many fish groups including groundfish, rockfish, forage fish, and many other varieties of finfish. Port Angeles Harbor is an important sport fisheries area. Ediz Hook sport fisheries have included salmon, ling cod, Pacific halibut, rockfish, and greenling (City of Port Angeles 1989).

In 2002, the WDFW published the results of the fish species caught in a trans-boundary trawl netting along the eastern Strait in 2000. Sixty-seven species were documented from the trawl survey (Palsson, et al. 2002). Table 3-6 lists those fish species that were observed in numbers greater than 25 on the U.S. side of the Strait.

The trans-boundary trawl documented 112 million bottomfish living in Washington's eastern Strait waters. Spotted ratfish comprised more than 75 percent of the fish population in Washington and B.C. Flatfish were the second most dominant species group in Washington. Pacific sanddab and English sole dominated the flatfish populations. In terms of numerical abundance, the "other species" category was dominated by walleye pollock. In terms of weight, pollock, skate, and sculpins were dominant (Palsson, et al. 2002).

Forage fish, rockfish, and salmon are found in the more immediate vicinity of Clallam County's shoreline (Clallam MRC 2005). Table 3-7 lists the fish that are common to the Clallam County area.

Forage Fish

Forage fish include Pacific herring, surf smelt, and Pacific sand lance. These species are a critical food source for salmonids, are associated with shorelines and beaches, and are known to spawn in Clallam County (Penttila 2001).

An enormous tonnage of migratory Pacific herring traverses the Strait annually. Herring usually spawn from late January through early April in the second or third year of life. Eelgrass and red algae have been documented as important spawning substrate for herring (Penttila 2001).

Surf smelt spawn by 2 years of age and prefer sandy gravel on intertidal beaches to lay eggs. While surf smelt spawn year-round in Puget Sound, they appear to spawn primarily in the summer in Clallam County (Penttila 2001).

Pacific sand lance, also called candlefish, is the least well-known of the shore-spawning forage fishes. The spawning season is from November to mid-February in the upper intertidal sand at high tide. Several spawning areas exist in Clallam County, with Ediz Hook being the western most documented site (Penttila 2001). It is possible that forage fish could occur in the project area.

Table 3-6 Eastern Strait of Juan de Fuca and Discovery Bay Fish Species Sampling, 2000[1]

Common Name	Genus Species Name
Spiny Dogfish	*Squalus acanthius*
Longnose Skate	*Raja rhina*
Spotted Ratfish	*Hydrolagus colliei*
Pacific Herring	*Clupea pallasi*
Pacific Cod	*Gadus macrocephalus*
Pacific Tomcod	*Microgadus proximus*
Walleye Pollock	*Theregra chalcogramma*
White Spotted Greenling	*Hexagrammos stelleri*
Buffalo Sculpin	*Enophrys bison*
Northern Sculpin	*Icelinus borealis*
Great Sculpin	*Myoxocephalus*
Ribbed Sculpin	*Triglops pingeli*
Roughback Sculpin	*Chitonotus pugetensis*
Sturgeon Poacher	*Agonus acipenserinus*
Shiner Perch	*Cymatogaster aggregate*
Pacific Sanddab	*Citharichthys sordidus*
Speckled Sanddab	*Citharichthys stigmaeus*
Arrowtooth Flounder	*Atheresthes stomias*
Starry Flounder	*Platichthys stellatus*
Flathead Sole	*Hippoglossoides elassodon*
Rock Sole unidentified	*Lepidopsetta* spp.
Southern Rock Sole	*Lepidopsetta bilineata*
Dover Sole	*Microstomus pacificus*
English Sole	*Parophrys vetulus*
Rex Sole	*Glyptocephalus zachirus*

Source: Palsson, et al.
Listed only species where 25 or more individuals were captured in the trawls.

Table 3-7 Fish Species Common to the Clallam County Shoreline Area

Fish Group	Common Name	Genus Species Name
Forage Fish	Surf Smelt	*Hypomesus pretiosus*
	Pacific Sand Lance (Candlefish)	*Ammodytes hexapterus*
	Herring	*Clupea harengus*
	Ling Cod	*Ophiodon elongates*
Rockfish	Black Rockfish	*Sebastes melanops*
	Blue Rockfish	*Sebastes mystinus*
	Brown Rockfish	*Sebastes auriculatus*
	Canary Rockfish	*Sebastes pinniger*
	China Rockfish	*Sebastes nebulosus*
	Copper Rockfish	*Sebastes caurinus*
	Puget Sound Rockfish	*Sebastes emphaeus*
	Quillback Rockfish	*Sebastes maliger*
	Vermillion Rockfish	*Sebastes miniatus*
	Yelloweye Rockfish (Red Snapper)	*Sebastes ruberrimus*
Salmonids	Chinook Salmon[1]	*Oncorhynchus tshawytscha*
	Chum Salmon[1]	*Oncorhynchus keta*
	Coho Salmon	*Oncorhynchus kisutch*
	Pink Salmon	*Oncorhynchus gorbuscha*
	Sockeye Salmon	*Oncorhynchus nerka*
	Steelhead	*Oncorhynchus mykiss*
	Cutthroat Trout	*Oncorhynchus clarki clarki*
	Bull Trout[1]	*Salvelinus confluentus*

Source: Clallam Marine Resources Committee (MRC) 2005; City of Port Angeles 2004.
[1] Denotes fish with an ESA listing or an Evolutionarily Significant Unit (ESU) ESA listing.

Rockfish

There are several species of rockfish along the Washington coast, including Clallam County. Rockfish, as their name implies, prefer rocky habitats. Rockfish have long life spans ranging from 20 to 60 years depending on the species. Besides longevity, rockfish have a slow maturation rate and tend to live in one place. Because rockfish have the characteristics of being vulnerable, slow growing, and not highly productive, many species have been petitioned for listing under the ESA. However, there are currently no rockfish on the ESA list. Rockfish could potentially occur in the project area.

Salmonids

The coasts of Clallam County support various Pacific salmon groups including Chinook, chum, sockeye, pink, coho, steelhead, and coastal cutthroat trout. The generalized life history of Pacific salmon involves freshwater incubation, hatching, and emergence then migration to the ocean. Subsequent initiation of maturation occurs in saltwater with a return to freshwater for completion of maturation then spawning (Myers et al. 1998). Three salmon stocks in Clallam County are listed as threatened under the ESA: the Puget Sound Evolutionarily Significant Unit (ESU) Chinook salmon; the Hood Canal summer-run ESU chum salmon (NOAA 2005b); and the Coastal-Puget Sound bull trout.

Chinook salmon, commonly referred to as king salmon, are the largest of the Pacific salmon. Chinook salmon can have different life-history strategies and therefore use marine habitat (estuary, coastal, and ocean) to different extents. The diet of outmigrating ocean-type Chinook salmon varies geographically and seasonally. Feeding appears to be opportunistic with aquatic insect larvae and adults making up a large portion of the prey items. The ocean migrations of Chinook salmon extend well into the North Pacific Ocean (Myers et al. 1998). Since the Puget Sound ESU Chinook salmon range does include the Port Angeles area (NOAA 2004c), it is possible that this species would be within the project vicinity.

Chum salmon are best known for the enormous canine-like fangs and the striking body color of spawning males. This species has the widest natural geographic and spawning distribution of any Pacific salmonid. Chum salmon usually spawn in coastal areas, and juveniles outmigrate to marine water almost immediately after emerging from the gravel. This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus *Oncorhynchus*, which usually migrate to sea at a larger size, after months or years of freshwater rearing (Johnson et al. 1997). Since the Hood Canal summer-run ESU chum salmon range includes the Port Angeles area (NOAA 2004d), it is possible that this species would be within the project vicinity.

Bull trout belong to the char group of the salmon family. Bull trout closely resemble the Dolly Varden, another native char. Bull trout typically have olive green bodies with cream to pale yellow spots, with larger fish having darker spots. Temperature is a major factor influencing bull trout distribution since spawning, egg incubation, and juvenile rearing all need specific temperatures. Bull trout prefer streams with abundant cover and clean gravel. They spawn from October to November in western Washington (Shellberg 2002). Since the bull trout range includes the Strait, as well as inland marine and fresh waters of Clallam County (USFWS 2005), it is possible that this species would be in the project vicinity.

3.3.1.7 Shellfish

Shellfish, including bivalves, crustaceans, and sea urchins, are an important commercial and ecological component of the Strait system. Information taken from WDFW Priority Habitats and

Species data shows three areas within the project vicinity that contain concentrations (WDFW 2005) of clams (east of the project area), geoducks (northwest of the project area), and sea urchins (along the first half mile [0.8 km] of the project area). The project is in a WDFW priority area for sea urchin and crab. Shellfish resources for Clallam County are discussed in the following subsections.

Bivalves

Many types of bivalves (e.g., clams, mussels, oysters) are found along beaches and flats of the Washington coast, including Clallam County. The geoduck, a large edible clam, is of particular commercial and tribal subsistence importance. The geoduck lives in the sandy mud of the lower intertidal and subtidal zones. A developing geoduck burrows into sediment at a rate of about 1 foot (0.3 m) per year. After digging about 3 feet (1 m) deep, the adult geoduck settles in the same hole for 100 years or more. It is most often found at depths between 10 and 80 feet (3 to 24 m) below the mean low tide mark (Department of Ecology 2005). Little is known about the life history and populations below 70 feet because of the difficulty of diving below this depth (Bradbury, et al. 1997).

Surveys for geoduck clams were conducted in August and September 2005 in the vicinity of the proposed project. The August 2005 survey found a density of 0.024 clams/foot^2 (0.26 clams/m^2). The September 2005 survey found a density of 0.008 clams/foot^2 (0.086 clams/m^2). These densities are low compared to the average density of geoduck clams in mud and sand habitat of Puget Sound at 0.16 clams/foot^2 (1.7 clams/m^2). WDFW habitat data shows a geoduck concentration occurring about 940 feet (287 m) west of the cable corridor (see Figure 3-3). Table 3-8 lists the bivalves commonly found in Clallam County (Clallam MRC 2005).

Table 3-8 Bivalves Commonly Found in Clallam County

Common Name	Genus Species Name
Abalone	*Haliotis* spp.
Cockle	*Clinocardium nuttalli*
Butter Clam	*Saxidomus giganteus*
Geoduck	*Panopea abrupta*
Horse/Gaper Clam	*Tresus* spp.
Manila Clam	*Venerupis philippinarum*
Various mussels species	*Mytilus* spp.
Native Littleneck	*Protothaca staminea*
Olympia Oyster	*Ostrea lurida*
Pacific Oyster	*Crassostrea gigas*
Source: (Clallam MRC 2005)	

Crustaceans

Ecologically and economically important, crustacean resources for Port Angeles include Dungeness crab (*Cancer magister*), spot shrimp (*Pandalus platyceros*), and coonstripe shrimp (*P. danae*) (Shaffer 2001). Though not identified as a major crab resource area by the WDFW Priority Habitat and Species Program (WDFW 2005), the Dungeness crab fishery is locally important to both commercial and recreational industries. The sport harvest of crab has remained relatively stable at about 80,000 to 90,000 pounds (36,000 to 41,000 kg) per year (Childers 2001). Dungeness crabs are widely distributed subtidally and prefer a sandy or muddy bottom in saltwater. However, they are tolerant of salinity changes and can be found in estuarine environments. They are generally in waters shallower than 90 feet (27.4 m), but they have been found at depths up to 600 feet (182 m). Dungeness crabs scavenge along the seafloor for organisms that live partly or completely buried in the sand. They are carnivores, and their diet may include shrimp, mussels, small crabs, clams, and worms (ADFG 2005).

The pandalid shrimp-pot sport fishery harvest is also a very important local resource with 50,000 to 60,000 pounds (23,000 to 27,000 kg) taken from the Strait annually (Childers 2001). Shrimp inhabit varying depths and habitat types of the marine environment. Spot and coonstripe shrimp are generally associated with rock piles, coral, and debris-covered bottoms. Coonstripe shrimp usually inhabit shallower waters, but can be found deeper, between 18 and 1,200 feet (5 and 366 m). Spot shrimp seem to congregate around 360 feet (110 m), but range from 12 to 1,500 feet (4 to 457 m). Most shrimp migrate seasonally from deep to shallow waters and also vertically in the water column. Pandalid shrimp are opportunistic bottom feeders that will eat a wide variety of items such as worms, diatoms, detritus (dead organic material), algae, and various invertebrates (ADFG 2005).

Sea Urchins

Purple (*Strongylocentrotus purpuratus*), red (*S. franciscanus*), and green (*S. droebachiensis*) urchins have an abundant and patchy distribution in the Strait (Shaffer 2001). Green andred urchins are harvested for food. Harvest levels of green urchins have been lower than the quota due to a decline in their value. The red urchin population has been in a steady decline. There was a reduction of the quota because of the lack of survey information (Childers 2001). WDFW Priority Habitats and Species data shows urchin habitat along the portion of the marine cable corridor within 0.5 mile (0.8 km) of the HDD hole end point (WDFW 2005). See Figure 3-3.

Sea urchins occur on rocky subtidal habitats from just below the low tide line to about 295 feet (90 m). Sea urchins graze on attached or drift algae, especially kelp in the Pacific Northwest. Sea urchins are often found in aggregations, whose combined feeding activities can remove all large plant material on or near rocky habitats (DFO 2004).

3.3.2 Environmental Impacts – Proposed Action

Potential impacts to marine habitat and wildlife would occur only from the construction of the portions of the proposed project that would be localized in the marine environments, i.e., the marine DC cable and the HDD hole end point. The following describes potential impacts to marine resources.

There would be ***no*** impacts to marine habitat or species from the construction or operation of the aspects of the cable that are not within the marine environment, including the terrestrial DC cable, the converter station, the terrestrial AC and fiber cables, and the Port Angeles Substation interconnection.

3.3.2.1 Protected Marine Species and Habitat

Of the 13 ESA threatened and endangered marine species that could occur within the project area, five would not be affected by the project. Eight species may be affected, but are not likely to be adversely affected. A biological assessment will be submitted to both NOAA and USFWS. Table 3-9 lists the species and a determination of effects on those species. The following discussions regarding impacts of the project address the effects on the various ESA-listed species.

Table 3-9 Threatened and Endangered Species Determination of Effects

Species[1]	Determination[2] of Effects
Brown Pelican (*Pelecanus occidentalis*)	May affect, not likely to adversely affect
Marbled Murrelet (*Brachyramphus marmoratus*)	May affect, not likely to adversely affect
Short-Tailed Albatross (*Phoebastria albatrus*)	No Effect
Green Sea Turtle (*Chelonia mydas*)	No Effect
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)	No Effect
Leatherback Sea Turtle (*Dermochelys coriacea*)	No Effect
Loggerhead Sea Turtle (*Caretta caretta*)	No Effect
Bull Trout (*Salvelinus confluentus*)	May affect, not likely to adversely affect
Puget Sound ESU[3] Chinook Salmon (*Oncorhynchus tshawytscha*)	May affect, not likely to adversely affect
Hood Canal Summer-Run Chum Salmon (*Oncorhynchus keta*)	May affect, not likely to adversely affect
Humpback Whale (*Megaptera novaeangliae*)	May affect, not likely to adversely affect
Steller Sea Lion (*Eumetopias jubatus*)	May affect, not likely to adversely affect
Southern Resident Killer Whale (*Orcinus orca*)	May affect, not likely to adversely affect

1. List from USFWS: http://westernwashington.fws.gov/se/SE_List/CLALLAM.htm
   NOAA Fisheries: http://www.nmfs.noaa.gov/pr/species/concern.
2. Determination may be altered as species and project information is compiled.
3. Evolutionarily Significant Unit.

Of the state-listed priority habitats and species in the vicinity, impacts would be low-to-moderate. See the following sections for descriptions of impacts.

3.3.2.2 Marine DC Cable

Construction of the cable could have impacts on marine species through direct and incidental contact, water quality changes, habitat alteration, noise, artificial night-lighting, food source reduction, and general construction presence. Operation of the cable could impact habitat through heat generation and possibly magnetic field changes.

Direct and Incidental Contact

As the ship and trenching equipment move across the Strait, marine species could have direct or incidental contact with the equipment, the equipment could collide directly with marine wildlife, marine wildlife could be entangled in tow lines, or marine life could be struck by strong velocities of water from propeller wash.

Benthic organisms, especially slow moving, fixed, or sediment-dwelling organisms (such as clams, mussels, small crustaceans, marine snails, sea cucumbers, marine bristle worms, urchins, and sea stars), would be most vulnerable to being buried or crushed if in the path of the trenching. Across the 10.5-mile (17-km) cable route in the U.S., organisms would be impacted within a swath of between 29.5 and 36 feet (9 m and 11 m) wide. This width includes the trench which would be between 4 to 16-feet (1.2 and 5-m) wide, the width of the trenching equipment (9.5 feet [3 m]), and a 20 foot (6 m) side-cast area where most sediment would settle. The total area of impact would be about 38 to 46 acres (15 to 19 ha).

Other sessile species attached to or imbedded in the seafloor adjacent to the cable corridor and beyond the sidecast area may be temporarily buried by smaller amounts of the sediment. Organisms buried would have varying success resurfacing or surviving in the newly-deposited sediments, depending on the type of organism buried. For about a 0.5 mile (0.8 km) within the Harbor where water depth is below 55 feet (17 m) deep, additional species would be struck by the force of the propeller wash. Recovery of the community of immobile benthic organisms would depend on species life histories.

Geoduck clams are a benthic species that would be impacted within the Harbor. Because they live in the same burrow for up to 100 years, they would not survive if the burrow is in the path of the trenching or if their siphons were covered.

Geoduck densities in the project area are low, between 0.024 and .008 clams/foot^2 (0.26 and 0.086 clams/m^2). Based on an impact distance of about 1,560 yards (1,426 m) (from the HDD-hole end point out to a water depth of 70 feet [21 m]), between 1,348 and 4,044 geoduck clams could be fatally injured by trenching, by either direct contact with the cable trench equipment or being buried by sidecast sediment. Since recruitment of geoduck clam populations is low (Goodwin and Pease 1989), recovery to pre-impact conditions may take several years. Compensatory mitigation, if required, for the loss of this resource would be negotiated with the Washington State Department of Natural Resources (DNR) and the WDFW. (See also impacts to Geoduck due to habitat alteration.)

Larger or more mobile benthic species, such as crab, shrimp, or ground fish would sense the movement of the hydroplow or the jetting action and could move out of the area. The ship would be moving slowly, at about 1 to 2 knots (1.2 to 2.3 mph, or 1.9 to 3.7 kph). Nevertheless, it is possible that these species would not sense in which direction to move to avoid the plow path, or would become disoriented and could be struck directly by the trenching equipment or cable. Within a few hours of the trenching equipment passing, mobile benthic scavenger species such as crab, shrimp, and sea stars, would typically migrate to the impact area to feed on benthic organisms that have been killed or injured.

Because the impact zone would be spread out over an 11 mile (18 km) strip rather than a single 30 to 46 acre (12 to 19 ha) block, the potential for organisms to be within the corridor would be relatively low and the probability of impacting entire colonies of benthic organisms would be low. This is a small area relative to the total benthic habitat within the Strait and Harbor. Overall, impacts to benthic species due to direct or incidental contact with the cable-laying ship or trenching equipment would be ***low-to-moderate***.

Open water fish and marine mammals would most likely hear or feel the vibrations of the ship and equipment and would leave the area. There is a slight potential for fish or a marine mammal to be incidentally hit by the ship, to collide or become entangled in tow cables, or to be struck by trenching equipment or the cable.

The three ESA-listed marine mammals with potential to be within the project area are the humpback whale, stellar sea lion, and southern resident killer whales. All three species are relatively rare and if present would be expected to avoid the ship noise and not be impacted by vessel collisions. It is also unlikely that other marine mammals would be impacted by collision, due to either the unlikelihood of the mammals being present in the strait (sea otter, minke whale, California sea lion) or because the mammals have elusive behaviors and would avoid the area (harbor porpoise, Dall’s porpoise). Gray whales exhibit curiosity toward boats and migrate through the Strait. Though there is a possibility that gray whales could be encountered if construction occurs during migration season, they would likely be accustomed to ship traffic in the Strait and not be injured. Mitigation measures include marine mammal observers on deck during marine construction.

It is equally unlikely for fish to be directly hit by the ship or equipment due to their mobility, including the two ESA-listed fish in the area (Puget Sound ESU Chinook salmon and Hood Canal summer-run chum salmon).

Overall, because the ship and trenching equipment would be moving slowly, because most fish and mammals would leave the general area of noise and vibration, and because mitigation measures include marine mammal observers, it is unlikely that fish or marine mammals would incidentally be struck by the cable lay-operations. Impacts would be ***low***.

Because the ESA-listed short-tailed albatross, brown pelican, and the four species of sea turtles recognized in Clallam County do not have ranges within the Strait, these species are not expected to be close to the project vicinity and ***no*** impacts are anticipated.

Water Quality

As described in Section 3.1.2, trenching for cable installation would have various impacts to water quality. Water quality impacts in the marine environment due to marine trenching include turbidity, dispersal of contaminated sediments, and accidental petroleum spills. (See Section 3.1, Water Resources, for water quality impacts due to releases of drilling fluids.) Water quality can impact marine species and the habitat in which they live.

Turbidity

The water turbidity caused by trenching activities would be low-to-moderate. Sediment plumes from trenching could spread up to about 0.5 mile (0.8 km) from the trenching activities, though most (80 to 90 percent) sediment would settle out within 20 feet (6 m) of the proposed trench, with the plumes correspondingly becoming less dense farther from the disturbance. Sediment plumes may also be generated by prop-wash in near shore areas. Mobile species such as mammals and fish would most likely avoid sediment plumes by swimming out of the path of the work equipment. ESA-listed fish bull trout and Puget Sound steelhead potentially could be affected by sediment plumes in the near shore area if they are migrating to or from Ennis Creek. If caught in the turbidity, mobile species could be disorientated and typical feeding or reproductive behavior would be disrupted. Impacts on mammals and fish would be ***low***.

Sessile or slow-moving species in the vicinity of the trenching also would be subjected to the turbidity. The level and type of impact and disruption would depend on how far the organism would be from the trenching activities and therefore how turbid the water. Organisms nearest to the most turbid portions of the plume may not survive the sedimentation; gills and bivalve filter-feeding mechanism could be clogged. Organisms farther from activities, in less turbid areas, may have feeding and foraging disrupted (crabs and urchins), and in some cases filter feeders could gain more potential nutrients and food sources through the suspension of nutrient-rich sediments. The closest eelgrass habitat (essential fish habitat) is located 0.3 miles (0.5 km) from the proposed trenching and HDD hole activities. Sediments would settle among the eelgrass, but not impact the vegetation or the species foraging or spawning within it. With trenching equipment moving at about 1 mph (1.5 kph) and sediment plumes settling within an hour, turbidity would be temporary and impacts on benthic species would be ***low-to-moderate***.

Dispersal of contaminated sediments

In the Harbor, water quality could be impacted through resuspension and dispersal of contaminated sediment, which may be a route for reintroduction of contaminants into the ecosystem. Fish and other predators would likely be attracted to the construction site because of the suspension of benthic organisms. Resuspension can allow contaminants to reenter the food web and accumulate in organisms through biomagnification (Nightingale and Simenstad 2001). Consumption of organisms that have been contaminated by surrounding sediment may magnify the contaminants in species at higher trophic levels. The Harbor contains some contaminates that are known for biomagnification including polychlorinated biphenyls, polycyclic aromatic hydrocarbons, mercury, lead, cadmium, copper, selenium, and zinc (see Section 3.1.1.1). Most recent sediment samples collected in the area (Malcolm Pirnie 2005) do not exceed Washington State sediment quality standards, so sediments and benthic organisms that could be suspended in the water column would have low levels of contaminates. These contaminates may be presently contributing to biomagnification in species foraging this area. Because the level of contaminates is low, dispersion of contaminates would be within a short range (0.5 mile [0.8 km]), and resuspension would be temporary (2 to 3 days), any additional biomagnification due to the resuspension of contaminates would be minimal and impacts would be considered ***low***.

<u>Accidental petroleum spills</u>

Water quality that has been impacted from any accidental oil or fuel spills during construction could cause morbidity or mortality of marine biota, including fish, invertebrates, and seabirds, through direct contact or ingestion of the material. Oil can smother aquatic organisms depriving them of oxygen. Sea birds' insulating feathers and marine mammals' fur can be infiltrated with oil, causing them to die from hypothermia or to sink. Because it is expected that water quality impacts due to accidental oil or fuel spills would be low (relatively small amounts of fuel oil would be carried on ships, and spill plans would be implemented), the potential impact to marine species would also be ***low***.

Habitat Alteration

<u>Trenching and Propeller wash</u>

Trenching activities and, within the Harbor area, the propulsion force from a ship's propeller would disturb soft substrate sediments impacting benthic habitat. The benthic habitat in the Strait along the trench route is various compositions of sand (gravelly sand, sandwaves, smooth sand, rough exposed glaciomarine till, and, in the nearshore areas, mud mixed with sand and occasionally gravel). Between 38 to 46 acres (15 to 19 ha) of benthic habitat within U.S. waters would be impacted. This area would include the trenched path, trenching equipment, and about 20 additional feet (6 m) along the trench where much of the sediments would settle. About 5 acres (2 ha) of habitat within the Harbor would included vegetated habitat of algae and kelp, which is essential fish habitat.

Seafloor recovery is expected to be rapid, with currents redistributing sediments over disturbed areas and filling in the trench. The construction activities would not affect any known fish spawning areas. How rapidly the area could recover would depend on the seafloor material impacted and the current flow regime. Recovery to preconstruction contours, in areas of active sand waves, could be as short as a few weeks. Areas with less current and finer sediment material could take longer to reestablish. The vegetative habitat would be expected to restore within one or two growing seasons (Newell, et al, 1998). The eelgrass habitat, 0.3 miles (0.5 km) east of the seabed construction activities, would not be impacted.

Organisms that were either undamaged by the trenching or next to the impact area would resettle in or on the sediment. The area would be recolonized by benthic organisms (Newell, et al. 1998), first by organisms with rapid reproduction and growth rates and later by longer-lived, slower growing and reproducing organisms. Marine benthic organisms are distributed by their pelagic larvae that enter their adult stage after settling on suitable substrate. This is expected within one reproductive season, which would occur within one month to one year (Newell, et al. 1998) post construction. Return rates of groundfish that may have been displaced could be immediate. Overall, long-term impacts to benthic habitat from trenching and propeller wash would be ***low***.

Heat Dispersal

Operation of the power cable would increase the temperature of the sediment surrounding the cable and warmer sediment may be unsuitable for a number of benthic organisms. (Please see Section 3.1.2.1 and Table 3-1 for a discussion of heat effects on substrate and water directly above the cable.) The cable core, which would be surrounded by insulation and protective armor, would be about 158°F (70°C) when operating at maximum capacity, increasing the temperature of sediments coming in contact with the outside of the cable. Sediment temperatures would decrease with increasing distance from the cable. It is estimated that sediment surface would have temperature increases in the range of 4.1°F (2.3°C) to 7.9°F (4.4°C), depending on the depth of the cable burial. Across the Strait from the U.S./Canadian border into Port Angeles Harbor, the benthic habitat within a strip of about 2 to 4 yards (2 to 4 m) over the cable would be impacted by increased temperatures for about 7 to 14 acres (3 to 6 ha) of habitat.

Scientific inquiry into the tolerance of increased sediment temperature by geoduck clams and other organisms has been sparse and little information is available. It is possible that geoduck clams, which can burrow to depths of 3 feet (1 m) as they grow, may not find the warm sediment around the operating cable suitable and a sustainable population of these clams would not colonize in this 2 to 4 yards (2 to 4 m) band over the cable. About 1 acre (0.4 ha) of geoduck habitat could be impacted. Though geoduck clam larvae may settle on the seafloor near the cable, the sediment would be warmer as the clam burrows into the sediment and since these clams are not able to relocate after they begin to burrow, they may not survive to a reproductive age of about two years. The benthic habitat disturbed by installation of the cable would be recolonized within one year; however the mix of organisms that are sustained when the cable is in operation may be somewhat different than that found in the surrounding area.

Water temperatures at the sediment-water interface directly above the cable route would be increased by less than 1.8°F (1°C), and the heat energy would dissipate quickly due to the cold water currents. Species that are not settling on the sea floor would not notice the water temperature change.

In the few areas where the cable may not be buried (up to 2,000 feet [610 m]), the cable bundle would lie on the ocean floor. In some areas this unburied cable would be covered by concrete mattresses or protective sleeves. Marine species could come in contact with the cable or the protective covering. To the touch, the cable would be about 140°F (60°C). Species could be injured or startled if they settle on the unburied cable.

Though species would recolonize in the corridor quickly, and habitat for various species would reestablish within hours and up to a few growing seasons, the long-term change in sediment temperature along the corridor would change the benthic habitat along the corridor. This overall area of benthic habitat change would be small compared to the benthic habitat available within the Strait and Harbor. Overall, impacts to benthic habitat due to the operation of the cable would be ***low-to-moderate***.

Electric and Magnetic Fields

Habitat could also be potentially altered by static electric and magnetic fields (EMF) generated by the cable. EMF levels decrease exponentially from the field source. The proposed cable would be buried between 3 to 5 feet (1 to 1.5 m) deep below the seafloor, and the magnetic fields measured at the seafloor may be slightly higher than the naturally-occurring geomagnetic field of the earth, which is 550 milligauss. Sharks and rays are sensitive to EMF, which is used for navigation and locating food (Kalmijn, Gonzalez, and McClune 2002). Elevated EMF may affect these species within a few yards or meters from the cable corridor; in this situation, sharks or rays would rely on other environmental factors (current, temperature, etc.) for navigation (Bailey, 2006). Little data or analysis has been reported of potential impacts from EMF from submarine power cables (Foster and Repacholi 2001). The Center for Marine and Coastal Studies at the University of Liverpool (2002) completed a review of existing information and concluded that the state of knowledge was too variable and inconclusive to make any assessment of the environmental effects of EMF. (See also Section 3.11.)

Noise

Underwater noise in the marine environment from construction vessels and equipment could impact mammals, fish, and shellfish. Noise that is above background levels can disrupt migrations; interfere with or mask communications, prey and predator detection, and/or navigation; cause adverse behavioral changes; or result in temporary or permanent hearing loss. (See Sections 3.4 and 3.10 for more information regarding noise impacts in air.)

Little information exists to describe how marine species respond physically and behaviorally to intense sounds and to long-term increases in ambient noise levels. Combined data from audiograms and models show there is considerable variation among marine mammals in both absolute hearing range and sensitivity (OSB 2003). Their composite range is from ultra- to infrasonic. Marine mammals as a group have functional hearing ranges of 10 Hertz (Hz) to 200 kilohertz (kHz) (Wartzok and Ketten 1999).

Odontocetes (toothed whales and dolphins) and pinnipeds are most sensitive to higher frequencies and mysticetes (baleen whales, e.g., humpback whales) are most sensitive to lower frequencies. Functional models predict mysticetes' hearing ranges from about 20 Hz to 20 kHz, while underwater audiograms for killer whales range from 1 kHz to about 150 kHz (Tollit 2005).

The Strait and Harbor have heavy ship and small boat traffic. Port Angeles Harbor receives several oil tankers that berth while waiting to deliver or receive products from other points within Puget Sound, and the M/V Coho automobile ferry traverses daily the same general route between the Harbor and Victoria, B.C. Several ocean going container vessels also pass through the Strait daily. A review of the Cooperative Vessel Traffic Services (CVTS) records for the period of six hours (November 19, 2004 between midnight and 6 am) found that 43 vessels transited through the project area. These vessels included ferries, container ships, ocean oil tankers, chemical tankers, bulk cargo ships, tugs and barges with lengths ranging from 41 feet (12.6 m) to 935 feet (285 m) and traveling at speeds from 1 knot to 31.5 knots (1.2 to 36.2 mph or 1.9 to 58.3 kph).

Based on the high volume of traffic in the area, the background level of underwater noise is expected to be similar to that reported by Nedwell et al. (2003), of about 120 dB (reference: 1µPa [see box]).

Sound Measurements in Air and Water

Sound consists of vibrations traveling through a medium such as air or water. These vibrations are sensed by people and other animals. Sound has variables, such as frequency (pitch) measured in Hertz and intensity (level) measured in decibels (dB). Normal speech is about 60 dB. Noise above 120 dB can cause discomfort to humans. (See Section 3.10 for more information regarding noise levels in air.)

Sound level is referenced to a known standard. One of these standards is pressure level. Sound intensity in air uses a standard of 20 micropascals (µPa), while sound intensity measured in water uses 1µPa. Because of this difference, equal numeric dB levels cannot be considered equal if one is in air and one is in water. For example, if a jet engine has a sound pressure level of 140 dB in air, the equivalent underwater sound pressure level would be 166 dB. The difference is the conversion of air sound pressure levels to water sound pressure levels. When a sound level is given and there needs to be a distinction between whether the level is in air or water, the number is followed by the standard referenced, that is, 178 dB **(re: 1µPa)**.

Underwater noise caused by cable trenching would be elevated above background noise during construction. Since the vessel would be moving slowly (at less than 1 knot [1.2 mph, 1.9 kph]), with the engines running at low revolutions per minute, and with the lubricated, cable-laying equipment reeling out the thick polyethylene yarn-coated cable, the vessel noise and vibration would be similar to or less than that of faster-moving oil tankers or marine merchant vessels. The trenching in the sediment on the U.S. portion of the Strait would mostly be in glacial till/glaciomarine drift, gravelly sand and fines and would not require excessive force to break rock. Underwater noise levels would not exceed 178 dB (re: 1µPa) @ 1 m (Nedwell et al. 2003).

The noise caused by cable trenching would be equal to background at a distance of about 1,360 feet (415 m) and would not likely be discernable beyond this distance. Trenching activities in the Strait from the U.S./Canadian border to the Harbor would take about 3 weeks, operating 24 hours a day. The area influenced by the noise would travel with the vessel and equipment.

The National Marine Fisheries Services (NMFS) currently considers underwater peak sound pressure levels at or above 160 dB (re: 1µPA) as constituting harassment of marine mammals and levels above 180 dB (re: 1µPA) as able to cause temporary hearing impairment in marine mammals (Norberg, September 27, 2006). For fish, NMFS considers levels at or above 150 dB (re: 1 µPa) root mean square (rms) pressure to cause behavior disruption and levels of 180 dB (re: 1 µPa) peak pressure as able to cause physical injury (Stadler, September 21, 2006).

Hearing is crucial for the well being of killer whales, yet threshold levels at which underwater noise becomes harmful to killer whales are unknown (Krahn, et al. 2004). Recent models designed to evaluate vessel noise levels relative to killer whale hearing detection capabilities predicted that the sounds of fast boats are audible to killer whales at distances of up to 10 miles (16 km), can mask their calls up to 9 miles (14 km) away, can elicit behavioral responses within about 220 yards (200 m), and may cause temporary hearing impairment after 30 to 50 minutes of exposure within about 500 yards (450 m) (Krahn, et al. 2004). Several studies have linked vessel noise and traffic with short-term behavioral changes in the southern resident killer whales. These include changes in swimming speed and call duration, unpredictable travel paths, alteration of dive times, movement to open water, and unusual surface pattern behaviors (Wiles 2004).

Because construction would produce a fairly constant noise (as compared to sudden explosions), mammals and fish could hear the noise and avoid the area, staying out of the 1,360 feet (415 m) radius of noise influence. This avoidance behavior could possibly alter other behaviors such as schooling, foraging, and group cohesion. If fish or mammals swam within the 1,360 feet (415 m) of the vessel, marine mammals would be exposed to noise levels considered harassment and fish would be exposed to levels that can cause behavior disruption.

It is unlikely that mammals or fish would be vulnerable to hearing impacts, since the levels would be below levels that could cause temporary hearing impairments or physical injury, and marine species would stay far enough from the activities to not be exposed to noise levels loud enough to induce damage. Harbor seals and the ESA-listed southern resident killer whale are the most commonly seen marine mammals in the project area. They would likely avoid construction activities.

Survey data suggests that the two seal haul-out locations in the Harbor are used primarily by harbor seals, with some possibility of usage by northern elephant seals, California sea lions, and Steller sea lions (which are federally-listed). The haul-out site on the inside of Ediz Hook is about 2 miles (3.2 km) from the corridor, and so seals using this site would not be affected by noise generated by the installation. The haul-out site off the Rayonier mill site is about 1,250 feet (380 m) from the corridor, and therefore within the range of increased noise over background levels. Seals may avoid using this site during construction, although it could be expected that those seals using this site would be accustomed to increased noise levels from the ship traffic in the Harbor. Harbor seals would be the most likely to be impacted.

Mitigation for juvenile salmon migration and bull trout migration would be implemented if required by USFWS and NOAA through consultation. Mitigation could include limiting marine in-water work in U.S. waters during migration seasons. With mitigation measures, there would be ***no*** impacts to bull trout, Puget Sound ESU Chinook salmon, and Hood Canal summer-run chum salmon, all ESA-listed species within the project area. Without mitigation measures, there would be ***low*** impacts to these species.

Overall, noise would disrupt marine mammal and fish behavior during construction. Impacts would be ***moderate***.

Vessel noise and vibration during construction could affect shellfish and benthic species by altering their behavior (i.e., filter-feeding in bivalves, foraging in crabs and urchins, and reproduction). These species would be more affected by turbidity than noise; impacts on shellfish and benthic species from noise would be ***low***.

Artificial Night-lighting

The artificial night-lighting on board the cable-laying ship would likely cast into the water next to the cable-laying vessel. Though the effects of night-lighting on mobile work platforms have not been directly investigated, inferences can be made from the few studies of fixed dock security lights. Prinslow et al. (1979, as cited in Nightingale and Simenstad 2001b) found that chum salmon congregated below security lighting and that greater levels of lighting attracted these fish and delayed their nighttime migration. This study also documented that 39 salmon predators were present when the lights were on and only two predators were observed when the lights were off. Artificial night-lighting can alter the fish species assemblages where light spills into the water and change salmon behavior, thereby exposing them to the risk of predation (Nightingale and Simenstad 2001b).

For the proposed project, though artificial night-lighting would be present, noise generated by the cable-laying activities would largely deter fish from congregating near the ship. Impacts on fish attracted to the artificial lighting therefore would be ***low-to-moderate***.

Food Sources

Marine species can be impacted if food sources are reduced or removed. As described in the Direct and Incidental Contact and Habitat Alteration sections above, trenching activities would kill or injure shellfish and other benthic species along the corridor. Vegetation would be impacted in the last mile as the corridor enters the Harbor. The number of organisms and the amount of vegetation impacted would not be significant in terms of depleting food sources for predator or foraging species. The corridor would recolonize within one or two growing seasons, though the number and type of sediment dwelling species may be less or different. The corridor would create a strip of adverse impact through the Strait, with vast adjacent areas for species to forage remaining in tact. Some scavenger species would enter the corridor within hours after construction to feed on killed or injured species. Impacts to fish as prey species would be ***low*** because fish would avoid or swim away from equipment and turbid waters. Because the reduction of potential food resources (benthic organisms and fish species) would be small relative to the surrounding resources, it is expected that there would be ***no-to-low*** impacts to marine predator species, including seabirds, due to reduced food resources.

General Construction Presences

The general presence of the ship, vessel wakes, and small boat activity could affect marine species. Seabirds occur throughout the project area, and within the Harbor, a seabird concentration area of various species is located about 0.5 mile (0.8 km) to the west of the HDD hole end point, on the opposite side of the old Rayonier pulp mill pier (see Figure 3-3).

It is possible that seabirds, including the threatened marbled murrelet (an ESA-listed seabird), would occur within the project vicinity. The short-tailed albatross and the brown pelican (both ESA-listed seabirds), have ranges that have historically included only the Washington Pacific coast, although an occasional brown pelican individual may disperse to the Strait of Juan de Fuca area. As such, it is very unlikely these species would be found in the in the project area.

Short-term disruption of seabirds could arise from the presence of or noise associated with the construction vessel. Most seabirds found in port areas are accustomed to vessels, and shortly after passage of the construction vessel, birds in the project area would return to areas of high use and not be permanently displaced from the vicinity. Vessel wakes could cause minor disturbances of seabird concentration areas by scattering the birds into smaller groups or causing some birds to take flight. The disturbance of colony areas from vessel wakes is unlikely since the cable-laying vessel would be traveling slowly (less than 1 knot), the concentration area is 0.5 mile (0.8 km), and the concentration area would be somewhat protected by the pulp mill pier. The strength of waves created by the vessels would be reduced once they reached this area. Overall, general construction presence, including ship wakes, would cause ***low*** impacts to marine species.

Cable Damage

If the cable were severed, whether due to a catastrophic natural event (earthquake) or human caused event (anchor), sensors in the system would stop the flow of electrical current in the cable. Accordingly, it is expected that there would be ***no*** impact to marine species from cable damage itself (see the following section for potential impact from repair activities).

Maintenance and Repair Impacts

Any maintenance or repairs required in the marine portion of the project route would have impacts similar to those described above, although the impacts would be limited to the area of the repair. Due to the limited scope and duration of likely maintenance or repair activities, these activities would have ***no-to-low*** impacts on marine resources.

3.3.2.3 Horizontal Directional Drill Hole

As described in Chapter 2, construction activities for the HDD hole within the marine environment would include excavation around the hole to capture drilling muds and drill cuttings, punch through of the hole end into the Harbor, and connection and pull-through of the cable. These activities would have similar impacts on marine species as the activities for the installation of the DC cable within the Harbor. Impacts could occur from direct and incidental contact, water quality changes, habitat alteration, noise, and food source reduction.

Direct and Incidental Contact

Direct and incidental contact between equipment and marine species could occur as the clam-shell bucket removes soil in the excavated area. The area would be either about 28 feet (8.5 m) in diameter and less than 2 feet (0.5 m) deep, or it would be about 18 feet (5 m) in diameter and 3 feet (1 m) deep. As with trenching, benthic species in the excavated area would be fatally injured, but fish and mammals would not likely be struck. There may be a greater abundance of benthic species in the shallower zone than within the Strait due to the presence of vegetation. The HDD hole end point would be just inside a Washington Department of Fish and Wildlife designated priority area for sea urchin and crab (see Figure 3-3). Overall, the area of excavation would be small relative to the near shore area within the Harbor. Impacts due to direct and incidental contact during the HDD hole work would be ***low-to-moderate*** for benthic species and there would be ***no-to-low*** impacts to fish and marine mammals.

Water Quality

As described in the Water Resources section, the excavation around the HHD hole end point and the release of drilling muds and cuttings during punch though of the hole into the Harbor would increase turbidity levels. Impacts to water quality would be low if the bore hole could be flushed prior to punch through, and potentially moderate if the bore hole cannot be flushed. As with trenching, sedimentation would most likely affect benthic slow-moving or stationary species. Fish and mammals would likely leave the area. Impacts to species in the area of the HDD hole work from sedimentation would be similar to trenching, ***low-to-moderate***.

Habitat Alteration

The habitat affected by the HDD hole end point excavation would include kelp and algae habitat. Depending on the dimensions of the excavation area, between 0.014 acres (0.006 ha) and 0.03 acres (0.01 ha) would be impacted (this includes 10 feet [3 m] of area bordering the excavated area that may receive heavy sedimentation). As with trenching in this habitat, it would be restored within one or two growing seasons (Newell et al, 1998). The eelgrass habitat, located 0.3 miles (0.5 km) east of the HDD hole end point, would not be impacted. The area of habitat that would be affected by the HDD hole end point excavation would be small relative to the size of the Harbor and impacts would be ***low***.

Since it is planned that drilling muds released would be removed from the sea floor and because bentonite is a non-toxic clay, if remnants of bentonite remain at the HDD hole end point it would disperse and mix with the existing sediments, not change the character of the soils, and hence not change the character of the habitat. No long-term change in habitat would occur from the HDD hole end point work in the marine environment; there would be ***no-to-low*** impacts.

Noise

Noise associated with the horizontal directional drilling would be mostly from equipment located upland on Liberty Street. The drilling noise is not expected to impact the marine environment; directional drilling would be conducted well below the seafloor and would not make a significant contribution to underwater noise until the drill head reached the hole end point, at which point the drilling would be complete.

Noise due to the excavating and ship presences would be similar to trenching; ***low-to-moderate***. Construction would create noise levels that would be at background levels at 1,360 feet (415 m) from the activities and marine mammals and fish would most likely flee the area; if present closer in, marine mammals could experience harassment and fish behavior could be disrupted; construction noise could cause cessation or reduction of feeding and disruption of behaviors in shellfish and benthic species.

Food Sources

Impacts to food sources from the HDD hole end point work would be similar to impacts caused by trenching activities (destroying or injuring benthic species, and removing vegetation). Because the area of impact is small (between 0.014 acres [0.006 ha] and 0.03 acres [0.01 ha]) in the overall area of the Harbor, the reduction of species that could be food sources to other species would be relatively small. The HDD hole work would cause ***no-to-low*** impacts to marine species due to reduced food resources.

3.3.3 Mitigation Measures

- Monitor the beach within 100 feet (30.5 m) of the route for concentrations of crab and urchins, under the supervision of a qualified biologist over a two-week period prior to installation for any work occurring between February and September. If the survey identifies an unexpectedly high concentration of these priority species that would be directly impacted by the project, then determine additional mitigation requirements in consultation with WDFW.
- Mitigate loss of geoducks based on agreements with the DNR and WDFW.
- Use procedures that reduce the volume of drilling muds and drill cutting discharged into the Harbor. (See HDD mitigation measures listed in Water Resources Section.)
- Assess impacts to nearshore habitat from drilling and trenching to a depth of 70 feet (21 m) within two weeks after cable installation is completed and again after one year during the growing season between June 1 and October 1. If the marine vegetation has not recovered to 80% of the density of adjacent areas within three years of monitoring, develop a mitigation plan in consultation from WDFW. (Mitigation measure also listed in Vegetation and Wetlands Section.)
- Institute control measures on the cable vessel to prevent the potential risk of an accidental release of any hazardous materials. (Mitigation measure also listed in Water Resources Section.)
- Use oil-adsorbent materials, maintained on the construction vessels, in the event of a petroleum product spill on the deck and/or if any sheen is observed in the water. (Mitigation measure also listed in Water Resources Section.)
- Implement appropriate mitigation measures as required by USFWS or NOAA through consultations, including potential work windows (for example, no in-water work from March 2 through July 15 to protect migrating juvenile salmonids and from February 16 through July 15 to protect bull trout).
- Mitigate potential impacts to state-protected species as required by WDFW based on consultation (for example, marine work windows outside of the gray whale migration season of June 1 to November 30).
- Have a trained marine mammal observer on board the cable-laying vessel to record any observations of marine mammals, especially ESA-listed species. During nighttime operations, the observer would use low-light binoculars for observations. During cable-laying operations, observations for a minimum of 10 minutes would be made at least four times each hour. If any listed species are observed, the following procedures would be followed:

  - If an individual or group of animals is observed at 1,000 yards (915 m) from the cable-laying vessel, then behavior would be recorded and vessel operators would be notified. No change to cable-laying operations would be required.
  - If an individual or group of animals approaches the cable-laying vessel within 500 yards (457 m), the behavior of the animals would continue to be recorded, and the vessel operator would be notified and preparations to reduce the speed of cable-laying operations would begin.
  - If an individual or group of animals approaches the cable-laying vessel within 400 yards (366 m), the behavior of the animals would continue to be recorded, the vessel operator would be notified, and cable-laying operations would be reduced to one-half speed. The operator would prepare to stop cable-laying operation if necessary.
  - If an individual or group of animals approaches the cable-laying vessel within 100 yards (91 m), the behavior of the animals would continue to be recorded, the vessel operator would be notified, and cable-laying operations would cease until the individual or group of animals had moved beyond 100 yards (91 m) of the vessel; then reduced-speed operations may be resumed.
- Deploy any item or material that has the potential for entangling marine mammals only as long as necessary to perform its task, and then immediately remove it from the project site.
- In the unlikely event that a marine mammal becomes entangled, immediately notify the stranding coordinator at NOAA Fisheries so that a rescue effort can be initiated.
- Aim work lights on the cable-laying ship and support vessels to illuminate work areas in such a way as to minimize spilling light into adjacent areas of water.

3.3.4 Unavoidable Impacts Remaining After Mitigation Measures

Impacts to marine habitat and species from the project with all mitigation measures in place would likely include direct contact with benthic species within about 38 to 46 acres (15 to 19 ha), incidental contact with fish, and unlikely contact with marine mammals due to vessels, trenching, and HDD containment area excavation. Habitat changes would include about 5 acres (2 ha) of algae/kelp habitat removed with expected re-vegetation within 1 or 2 growing seasons, and about 7 to 14 acres (3 to 6 ha) of benthic and sediment habitat changed due to increased sediment temperatures. Work within the Harbor could possibly contribute to biomagnification of contaminants in species within the food chain. Trenching and vessel noise impacts would potentially disrupt benthic species behaviors including filter feeding and foraging; fish and mammals could be impacted by avoiding the area and possible disruption of communications, migration, and feeding behaviors. Artificial light used at night on the cable-laying vessel could potentially disrupt behaviors of fish and marine mammals attracted to the light.

3.3.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create ***no*** impacts to marine species.

3.4 Terrestrial Wildlife and Freshwater Fish

3.4.1 Affected Environment

This section describes the terrestrial animal species and freshwater fish species in the project area. The terrestrial portion of the project is located within the City of Port Angeles which is primarily an urbanized area. However, some wildlife habitat is present, including the harbor shoreline, forested areas, and three creeks (Ennis Creek, White Creek, and Peabody Creek).

Most of the terrestrial cable route follows paved roadways, which provides minimal wildlife habitat. Where Liberty Street ends at the shoreline, there is a bluff that drops down toward the old Rayonier pulp mill site. This bluff also runs north along the Ennis Creek drainage. The project would be 600 feet (180 m) west of the bluff of Ennis Creek and about 800 feet (240 m) south of the Harbor shoreline bluff. Common wildlife species that may occur along the shoreline bluffs include deer, raccoons, opossum, gray squirrels, burrowing rodents, song birds, waterfowl, and shorebirds.

The proposed 5-acre (2-ha) converter station property is a mix of habitat including an open lot seeded with grass, a shrubby area underneath the transmission lines, and an area of coniferous forest along the western edge. This site is surrounded by roads and urbanized development. Due to its isolated nature and habitat mix, this site likely provides habitat for smaller species of mammals (such as squirrels, raccoons, and burrowing rodents), as well as birds. However, the site likely does not support larger species such as deer or species requiring large areas of undisturbed habitat.

The Port Angeles Substation interconnection expansion area lies beneath existing transmission lines, and the habitat consists of shrubs, legumes, grasses, and exposed soil. A mixed stand of conifers and deciduous trees borders both the east and west sides of the BPA property adjacent to the expansion area and provides habitat for small mammals and birds. The forested area on the east side of the property abuts a contiguous block of relatively undeveloped and forested habitat to the south and east that provides connectivity to the White Creek and Ennis Creek riparian corridors. These riparian areas provide an almost continuous corridor between the upland areas and mountains to the south of the project area and the shoreland and marine environments of the Strait to the north. These riparian corridors are likely significant travel routes for many medium and large mammal species and many bird species. These species would be similar to those along the bluff, (deer, raccoons, opossum, gray squirrels, burrowing rodents, song birds, waterfowl, and shorebirds) and may periodically travel into the cable corridor.

Ennis Creek and White Creek provide habitat for both anadromous and resident fish populations. Both creeks are listed as fish-bearing streams by Department of Natural Resources (DNR) Forest

Practices maps; however, culverts on White Creek and generally poor water quality make this creek unlikely to have sustained fish populations. During project environmental field surveys (April 2005), fish weirs were observed near the mouth of Ennis Creek. The tribe of Klallam is currently maintaining and collecting data from the fish weirs. Peabody Creek has poor water quality, but provides habitat to cutthroat trout.

3.4.1.1 Protected Species and Habitat

The WDFW Priority Habitats and Species database identified an area used year-round by waterfowl about 1.5 miles (2.4 km) west of the cable landing site at the Waterfront Trail near Hollywood Beach (see Figure 3-3). Another area includes the Waterfront Trail near Ennis Creek where it has been documented that loons (*Gavia* sp.) use the area out to 0.25 miles (0.4 km) off shore. The database identified anadromous fish present within Ennis Creek, including coho salmon, bull trout, and winter steelhead. Cutthroat trout are the resident species present within Ennis Creek and White Creek. Anadromous fish within White Creek only include coho salmon.

The WDFW Priority Habitat and Species database and other databases identified several ESA-listed species that may occur within the project vicinity. Special-status terrestrial species that have been identified within the project area include the bald eagle and northern spotted owl, coho salmon, bull trout, and Puget Sound steelhead (see Table 3-10).

Table 3-10 Endangered Species Act-Listed Species Found in the Terrestrial and Freshwater Environment in Clallam County, Washington

Species[1]	Status[2]	Jurisdiction[3]	Possibly Present in project Area
Bald Eagle (*Haliaeetus leucocephalus*)	T	USFWS	Yes
Northern Spotted Owl (*Strix occidentalis caurina*)	T	USFWS	May Occur
Marbled murrelet (*Brachyramphus marmorata*)	T	USFWS	May Occur
Bull Trout (*Salvelinus confluentus*)	T	USFWS	Yes
Puget Sound Steelhead (*Oncorhynchus mykiss*)	PT	NOAA	Yes

1. List from USFWS: http://westernwashington.fws.gov/se/SE_List/CLALLAM.htm
   NOAA Fisheries: http://www.nmfs.noaa.gov/pr/species/concern
2. Status: Threatened (T), Proposed Threatened (PT)
3. United States Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA).

Bald Eagle

The bald eagle is a federally-listed threatened species and was proposed for delisting on July 6, 1999 (64 Federal Register [FR] 36453). The historical decline of the bald eagle has been attributed to a loss of feeding and nesting habitat, shooting, organochloride pesticide residues, poisoning, and electrocution. However, in recent years, the population in the continental U.S. has increased dramatically.

The bald eagle is closely associated with estuaries, large lakes, reservoirs, major rivers, and some seacoast habitat (64 FR 36453). Fish constitute the major component of its diet, but bald eagles are known to feed on waterfowl, gulls, and carrion. Bald eagles usually forage in large open areas with a wide visual field and suitable perch trees near the food source.

Bald eagles need large trees near open water that are not subject to intense human activity (Stinson, Watson, and McAllister 2001). In Washington, about 99 percent of all nests are within 1 mile (1.6 km) of water. The favored nest tree is usually the largest tree or snag in a stand that provides an unobstructed view of the surrounding area. Nests usually are built on the limbs just below the crown, with canopy above to provide cover. In western Washington, most bald eagles begin to incubate their eggs by the third week of March, and young hatch by late April (Stinson, Watson, and McAllister 2001).

The database identified several records of bald eagle nest sites within 1.5 miles of the project area. Several historic nest sites were identified about 1 mile (1.6 km) to the east of the proposed cable landing site, however, these sites have not been occupied since 1998. Another nest site occupied as recently as 2002 was identified about 1.5 miles (2.4 km) west of the project area. Another bald eagle nest was documented in 2003 but use of the nest has not been verified. The nest is about 2.4 miles (3.9 km) to the west of the proposed cable landing in Port Angeles (WDFW 2005). During field surveys in April 2005, one juvenile bald eagle was observed perched on the bridge crossing at the mouth of Ennis Creek.

Northern Spotted Owl (*Strix occidentalis caurina*)

The northern spotted owl was federally listed as a threatened species in Washington, Oregon, and California on July 23, 1990 (57 FR 26114) as a result of a loss of nesting habitat. Critical habitat for the owl was designated on January 15, 1992 (57 FR 1796), by setting aside 190 individual critical habitat units on federal lands in the three states. The proposed project area is outside northern spotted owl critical habitat in Washington, and the WDFW (2005) Priority Habitats and Species database does not list any northern spotted owls in the project vicinity. Some areas of coniferous forest exist within the project area, however these areas do not provide suitable nesting habitat. Some incidental use by dispersing or foraging individual owls may occur, but is unlikely given the lack of suitable habitat nearby.

Marbled Murrelet

Marbled murrelets (*Brachyramphus marmoratus*) were listed as threatened by the USFWS in 1992 and are currently listed as threatened with the Washington Department of Fish and Wildlife. Marbled murrelets are year-round residents on Washington's marine waters. These birds forage in sheltered waterways and harbors generally within 1.2 miles (1.9 km) of shore.

Marbled murrelets nest in mature and old-growth forests within 60 miles of marine waters from Alaska to northern California. The breeding season extends from April 1 to September 15. Old-growth and mature forest stands appear to be important to and are visited by marbled murrelets year-round. Marbled murrelets have been documented near the project area, but only as they were flying between nesting sites to the south of Port Angeles and the marine environment. There are no documented marbled murrelet nest sites or potential murrelet nesting habitat in or adjacent to the project area (WDFW 2005).

Bull Trout and Puget Sound Steelhead

Coastal/Puget Sound bull trout were listed as threatened (64 FR 58909) under the Endangered Species Act on November 1, 1999. In Washington bull trout occur in major streams of the coastal drainage, Puget Sound, the Columbia River, and in some large lakes such as Ross, Chester Morse, Wenatchee, and Chelan (Wydoski and Whitney 2003). Bull trout prefer cold, unpolluted water, spring- and groundwater-influenced systems with loose gravel substrate, a low gradient, and bank cover for spawning. They are considered adults at about 4 years old and spawn in late summer. Juveniles move downriver in the spring, spend summer in the estuary, and winter back in the lower river. This temporal and spatial life history pattern generally limits the extent of their marine migrations. Specific threats to bull trout populations include habitat destruction and fragmentation due to logging and agricultural land practices.

Puget Sound steelhead were proposed to be listed as threatened under the Endangered Species Act on March 29, 2006 (1FR15666). A final determination about whether steelhead should be listed as threatened should occur within a year. The listing would include all naturally-spawned anadromous winter-run and summer-run O. mykiss (steelhead) populations, in streams in the river basins of the Strait, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks.

Steelhead tend to spawn from winter through spring in moderate to high-gradient sections of streams. In contrast to Pacific salmon, steelhead females do not guard their redds, but return to the ocean following spawning. Most steelhead juveniles reside in fresh water for 2 years prior to emigrating to marine habitats. Seaward migration occurs principally spring. Puget Sound steelhead feed in the ocean for 1 to 3 years before returning to their natal stream to spawn.

Bull trout and Puget Sound steelhead may be present in Ennis Creek and White Creek.

3.4.2 Environmental Impacts – Proposed Action

Wildlife species found in the terrestrial environment could be impacted by the project through noise disturbance during construction and habitat alteration. Freshwater fish species could potentially be impacted by the release of drilling fluids in the event of a fracture during horizontal directional drilling and by increases in stormwater run-off into nearby streams.

3.4.2.1 Threatened and Endangered Species

Of the 5 ESA-listed terrestrial or fish species that could occur within the project area, one of them would not be affected by the project while four of the species may be affected, but are not likely to be adversely affected. Table 3-11 lists the species and a determination of affects on those species. A biological assessment will be submitted to both NOAA and USFWS. The following discussions regarding impacts of the project addresses the effects on the various ESA-listed species.

Table 3-11 Threatened and Endangered Species Determination of Effects

Species[1]	Determination[2] of Effects
Bald Eagle (*Haliaeetus leucocephalus*)	May affect, not likely to adversely affect
Northern Spotted Owl (*Strix occidentalis caurina*)	No Effect
Marbled Murrelet (*Brachyramphus marmorata*)	May affect, not likely to adversely affect
Bull Trout (*Salvelinus confluentus*)	May affect, not likely to adversely affect
Puget Sound Steelhead (*Oncorhynchus mykiss*)	May affect, not likely to adversely affect

1. List from USFWS: http://westernwashington.fws.gov/se/SE_List/CLALLAM.htm
   NOAA Fisheries: http://www.nmfs.noaa.gov/pr/species/concern
2. Determination may be altered as species and project information is compiled.

3.4.2.2 Marine DC Cable

The marine portion of the cable would not have direct impacts on terrestrial species except when work within the Harbor may cause noise and activity that could potentially disturb bald eagles foraging near Ennis Creek. The eagles would most likely move elsewhere to forage and eagles in this area would be accustomed to ship and industrial-type of activities. Impacts would be ***low***. There would also be ***no*** impacts to freshwater fish due to the marine portion of the cable. Effects to anadromous fish are discussed in Section 3.4, Terrestrial Wildlife and Freshwater Fish.

3.4.2.3 Horizontal Directional Drill Hole

Wildlife

The HDD hole construction site would be within 600 and 800 feet (180 and 240 m) of the bluff habitat. The drilling noise would be about 90 to 95 decibels (A-weighted) (dBA) and would run continuously for 23 days. Because the bluff habitat is over 500 feet from the drilling site and the bluff drops below the elevation of the construction site, noise levels would drop off considerably within the habitat. However, common wildlife may be disturbed by the noise and temporarily leave the area.

Some eagles are likely to be present in the project area, but these would usually be individual eagles foraging or flying overhead. The nearest bald eagle nest is 1 mile (1.6 km) or more away from project construction. Foraging eagles may be disturbed by noise from the HDD construction or by visual disturbance from construction equipment and human activity. Disturbance of this sort would temporarily displace these eagles and would not preclude them from using the area in the future. This type of disturbance would also not prevent bald eagles from completing any portion of their lifecycle to the extent that would reduce the health of any individual eagle or population of eagles. Most bald eagles in the Port Angeles area are accustomed to relatively high amounts of human disturbance and are not expected to be disproportionately affected by the proposed construction activities.

Because no suitable marbled murrelet habitat exists within the project area, impacts to any murrelets that might be passing over the project area would also be limited to noise and visual disturbance. This type of disturbance may cause an individual murrelet to slightly alter course, but would not otherwise be expected to affect behavior, or prevent any murrelets from passing through or over the project area.

Overall, disturbance to wildlife, including murrelets, due to noise from the HDD work would be temporarily and impacts would be ***low***. Impacts to eagles would also be ***low*** with the inclusion of mitigation measures for eagles (including determining if any occupied nests, nocturnal roost sites, or wintering concentration areas are within 1 mile (1.6 km) of project activities prior to construction).

The HDD hole would be drilled under the shore bluff habitat and no construction activities would occur within several hundred feet from the habitat edge. There would be ***no*** impacts or alteration to the habitat itself.

Fish

As discussed in Section 3.1, Water Resources, drilling of the HDD hole has the potential of fracturing bedrock or soil or opening-up existing fractures. If a fracture goes all the way to the soil surface, pressurized drilling fluids could be discharged out the fracture. A fracture into a creek could release 63 to 220 $yards^3$ (48 to 168 m^3) of drilling fluids containing water, bentonite, and possibly a polymer and would be a moderate-to-high impact to water quality, with a low probability of occurrence. The HDD hole route would pass under Ennis Creek near the interface with the Harbor shoreline. If there was an accidental release due to a facture, bentonite would be expected to wash down stream into the Harbor and would not be high enough up stream to impact spawning habitat. The turbidity could disorient or cause gill abrasion for fish present in the tidal influence area, but would not cause permanent injury or mortality. The probability of the accidental release of drilling fluids into Ennis Creek is very low, and if it did occur, impacts to fish present in the stream would be ***low***.

The HDD hole would be drilled about 130 feet (40 m) in the bed rock below Ennis Creek and, in the absence of the release of drilling fluids, there would be ***no*** impact to the stream habitat, resident fish, bull trout, or steelhead in the terrestrial reaches of the stream.

3.4.2.4 Terrestrial DC Cable

Wildlife

Most of the upland cable would be trenched within paved roadways that have minimal wildlife habitat (only foraging birds and small mammals). Construction would cause noise and human presence and, but for the blasting required, would be consistent with activities occurring regularly in the city. Blasting during trenching would occur on Liberty Street between 5th and 8th Streets about twice a day over 10-days and may cause wildlife to temporarily leave or avoid the area. With inclusion of mitigation measures for eagles, overall impacts to wildlife from construction of the terrestrial DC cable would be ***low***. The terrestrial DC cable would not remove any wildlife habitat.

Fish

Increases stormwater runoff amounts or patterns can affect stream discharges. Fish can be impacted if peak flows within a stream are increased. Increased peak flows can cause scouring of redds (eggs in the stream gravels), channel widening, stream downcutting, removal of large woody debris and increased bank erosion, which can lead to increased sedimentation of some redds. Increased peak flows can also directly affect juvenile and resident salmonids by moving them to other locations downstream or by tiring them out if access to lower energy refuge areas within the system is not present.

As described in Section 3.1, Water Resources, trenching within city streets would likely intercept shallow perched groundwater zones if the trenching is conducted during the wetter months. Water encountered during trenching would need to be pumped from the trench and managed as stormwater. Although it is not known how much water would be generated, it would be over a 1-month period. Even if the construction period corresponded with peak water flows in Ennis and White creeks, water pumped from the trench would contribute enough stormwater to increase water flows and impact fish habitat; there would be ***no-to-low*** impacts to fish.

3.4.2.5 Converter Station

Wildlife

The construction of the converter station would require the removal of about 3.1 acres (1.3 ha) of mixed habitat, including low-quality grass habitat, some shrub habitat of younger trees and bushes, and about 1 acre (0.4 ha) of forested habitat (Douglas fir, cedar, alder, and hemlock). The grass and shrub habitat are regularly maintained and thus not expected to provide important habitat for any species. The trees that would be removed from the forested habitat are not suitable spotted owl or marbled murrelet nesting trees. Because this site is isolated with roads and surrounding development, it provides habitat only for smaller species of mammals and birds, but would not support larger species such as deer. Impacts to terrestrial wildlife due to habitat removal for the construction of the converter station would be ***low***.

Any wildlife on the property and in the general vicinity would most likely leave the area during construction due to noise and disturbance. The noise from the converter station operation would be about 40 to 65 dBA and would not be out of character with surrounding noise. There would be ***no-to-low*** impacts to wildlife from the converter station construction or operational noise.

Fish

Increases in impervious surfaces can affect stream discharges by increasing stormwater runoff. The frequency and amount of stream discharge strongly influences substrate and channel morphology conditions, as well as the amount of available spawning and rearing habitat for salmon. In general, the more impervious surface in a watershed, the shorter the duration and the higher the intensity of instream flows during and following storm events and the lower the base flows in mid-winter and late summer.

As described in the Section 3.1, Water Resources, the annual stormwater runoff for the impervious area created by the converter station building would be about 336,500 feet ^{3} (9,500 m^3). Because the stormwater infrastructure in the area of the converter station is near capacity, the building runoff may need to be detained on site during storm events and allowed to slowly enter the stormwater system. Stormwater in this area drains to White Creek and then into Ennis Creek. Without mitigation measures, increased stormwater runoff could potentially have a ***low*** impact on fish habitat. However, with mitigation measures, the stormwater from the new impervious area at the converter station would be managed to prevent increases in peak flows, either by being detained on site or by other means, fish habitat would not be impacted. Therefore, there would be ***no*** impacts to fish, including bull trout and Puget Sound steelhead, in the terrestrial portion of the streams. Effects of the project on bull trout and Puget Sound steelhead would be limited to the tidal and nearshore portions of the project area, and are covered in Section 3.3, Marine Habitat and Wildlife.

3.4.2.6 Terrestrial AC Cable

About 0.25 acre (0.1 ha) of tree clearing would be required for either Option A or Option B as the AC cable enters the BPA property. The clearing would occur in an isolated stand of mixed conifer and deciduous forest, which provides only minimal amounts of habitat for small mammals and birds.

Construction of the AC cable would remove some of the available habitat, but the habitat type is common in the area and no population-level impacts to birds and mammals is expected; impacts would be ***low***.

Construction of the fiber communication cable would be in paved streets or along a gravel road entering the BPA property and would not remove any vegetation used by wildlife. There would be ***no*** impacts.

3.4.2.7 Port Angeles Substation Interconnection

Wildlife

Some tree clearing would be required as part of the Port Angeles Substation interconnection. As described in Section 3.2, Vegetation and Wetlands, about 2.5 acres (1 ha) of mixed conifer and deciduous forest would be cleared on the west side of the substation adjacent to the area cleared for the terrestrial AC cable (see above). This forest habitat is relatively isolated, providing minimal habitat for small mammals and birds.

On the east side of the substation property, about 1 acre (0.4 ha) of clearing would occur in an older stand of mixed conifer and deciduous forest that is connected to a larger forested area to the east, including the riparian corridor of Ennis Creek (see Figure 3-2). This area provides higher quality wildlife habitat because it is connected to the larger riparian corridor. The area likely has a higher density of species, including larger species such as deer than the surrounding isolated forested areas affected by other portions of the project. However, tree removal would take place on the edge of the forested area, which would only affect a small amount of available wildlife habitat. The forested area would be considered marginally suitable for spotted owls or marble murrelet nesting and if transient spotted owls were present in or near the project area, they would likely move to another more suitable location if disturbed by construction activities.

Much of the area cleared of trees would be allowed to re-vegetate with low-growing plants, providing some habitat, although lower quality than the existing forest.

About 2 acres (0.8 ha) of grasses and shrubs would be permanently removed for the electrical yard and equipment. This habitat may provide open grazing or foraging space adjacent to the forested area, but the habitat type is abundant and common in the area.

Construction of the substation interconnection would remove some available habitat, but the habitat type is common to the area and no population-level impacts to birds and mammals is expected; impacts to terrestrial wildlife species due to the removal of habitat on the BPA property would be ***low-to-moderate***.

Fish

The new impervious area created by the interconnection’s 36-foot by 20-foot (11-m by 6-m) relay house would generate about 1500 feet^3 (140 m^3) of stormwater runoff a year. Stormwater from the Port Angeles Substation eventually drains into Peabody Creek. This amount of run off is relatively small and would not be expected to affect peak flows in the creek. Additional runoff may be created by tree removal, which would lessen the amount of water absorbed by trees in the area. Because rain water would still be able to infiltrate the soil, the overall amount of runoff to Peabody Creek would be minor and would not affect peak flows. Therefore, there would be ***no-to-low*** potential impacts to the resident trout fish in the stream from the Port Angeles Substation interconnection.

3.4.3 Mitigation Measures

- Implement appropriate mitigation measures for bald eagle if required by USFWS through Section 7 consultations and stated in the biological opinion. Measures could include limitations to construction timing for noise producing activities.
- Develop a dewatering plan for trenching activities in consultation with the City of Port Angeles. (Mitigation measure also listed in Water Resources Section.)
- Provide appropriate long-term stormwater detention or control facilities at the converter station site so that peak flows in Ennis and White creeks are not increased from pre-existing levels. (Mitigation measure also listed in Water Resources Section.)

3.4.4 Unavoidable Impacts Remaining After Mitigation Measures

Some reduction in the amount of existing wildlife habitat is unavoidable due to the need to remove trees from portions of the project area. However, the available habitat is generally disturbed and of low quality. Also, noise and visual disturbance from construction equipment to various wildlife species during the construction phase of the proposed project is unavoidable; however these impacts would be temporary.

3.4.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create ***no*** impacts to terrestrial wildlife or fish species.

3.5 Geology and Soils

3.5.1 Affected Environment

3.5.1.1 Geology

The project area has been shaped by the tectonic movement of continental plates, glaciers, and human activity. The area is within the active region of the Cascadia subduction zone, where the North American Plate is overriding the Juan de Fuca Plate. Convergence of the two plates, from the Tertiary period (65 to 2 million years ago) to the present day, is responsible for the complex folding and faulting of the bedrock throughout the Olympic Peninsula.

Much of the current landscape was also scoured and sculpted by glaciers during the Pleistocene epoch (1.8 million to 10,000 years ago). The glaciers left behind sediments and the deep channels, submarine ridges, basins, and bays that comprise the many waterways of the region. Since the time of the glaciers, some sediments have eroded, and have been redeposited and compacted.

Human activities have also changed the landscape, including excavation in some areas and the use of fill in other areas.

Elevation varies from about 580 feet (177 m) below mean sea level (MSL) near the Canada-U.S. border in the Strait, to about 350 feet (107 m) above MSL in the foothills at the BPA Port Angeles Substation.

Mineral and Paleontological Resources

There are no known mineral resources in the project area, but within 20 miles (32 km) there are a drilled petroleum exploration well, thin stringers of coal and carbonaceous materials (Brown, Gower, and Snavely 1960), one rock/stone quarry, and 11 sand and gravel pits (Shawver 2005).

Paleontological resources (i.e., plant or animal fossils) are considered a non-renewable resource. No paleontological resources are known to occur within the more recent sediments underlying the proposed project corridor. However, the upper Olympic Peninsula is generally considered to be rich in paleontological resources due to significant finds in the area, including the Manis Mastodon (Danner 1951) found east of Port Angeles and a toothless whale fossil found west of Port Angeles (Stricherz 1998). Accordingly, there is potential for these resources in the project area. Mollusk shells, foraminifera, and carbonized plant material have been found in mudstone that underlies the surface sediments in the project area.

3.5.1.2 Soils and Sediment

Soils

Four soil types are present within the project area (USDA SCS 1987); none are agricultural or prime farmland soils (see Figure 3-4).

Most of the trenching for the DC and AC transmission line cables would be in Clallam-Hoypus gravelly sandy loam. This soil type is generally located on hills and glacial outwash terraces and is moderately deep and moderately well drained. The potential for erosion is slight.

The proposed converter station site and the Port Angeles Substation are located on Clallam gravelly sandy loam, which formed in glacial tills on hills with slopes between 0 and 15 percent. The soil is moderately deep and moderately well drained. The potential for water erosion is slight.

The HDD hole would be drilled under Puget silt loam. This soil formed in recent alluvium on 0 to 3 percent slopes on low terraces and floodplains. The soil has been extensively modified within the project area. The soil is generally very deep and poorly drained, but has been artificially drained where modified. The unit has moderately slow permeability. The potential for water erosion is slight.

The HDD hole would also be under the Beaches soil type, which is typically in long, narrow stretches along the shoreline. These areas are mainly above mean tide level, but are subject to ocean wave action during storms. The soil is generally characterized as bare and typically consists of gravel, cobbles, and sand. In the project area, this soil has been subject to modification, including importation of fill material for the Rayonier pulp mill.

Submarine Sediments

When the glaciers retreated after forming the Strait, deposits of glacial tills, glaciomarine deposits, and outwash up to 3,600 feet (1,100 m) thick were left behind (Archipelago 2005).

Modern sediments also accumulate in the Strait, mainly in isolated basins. These sediments are mostly muds, sand, and coarser-grained materials, including cobbles and boulders (Archipelago 2005). Recent sediments also include some pollutants (see Section 3.1.1.1, Marine Sediments).

Marine sediments undergo active transport toward the east by longshore drift and tidal currents, which are responsible for the formation of Ediz Hook. The Elwha River, located about 7 miles (11 km) west of the project area, was impounded by two dams in 1910 and 1926, which eliminated a major source of sediment to the Strait. To reestablish salmon runs in the Elwha River, the dams are scheduled for removal beginning in 2007 (see Section 3.13, Cumulative Impacts, for more information about the planned removal of these dams). Following removal of the dams, sediment supply to the Strait is expected to increase.

Industrial outfalls, storm drains, spills from vessels, and other sources have resulted in water and sediment contamination in some areas of Port Angeles Harbor (see Section 3.1, Water Resources). One of the contaminated areas is the former Rayonier pulp mill site (dismantled). In addition to industrial activities along the shoreline, the City of Port Angeles and the former Rayonier pulp mill have wastewater outfalls discharging treated wastewater into Port Angeles Harbor.

3.5.1.3 Geologic Hazards

Geologic hazards in the area include faults and earthquakes, liquefaction, tsunamis, slope failures and sea floor mobility, and erosion.

Faults and Earthquakes

Earthquakes are caused by the abrupt release of stress that accumulates within or between tectonic plates. The geologic hazards directly related to earthquakes include ground shaking and displacement, or rupture, along faults that reach the earth's surface. Most earthquake-related damage is caused by strong ground shaking. The strength of ground shaking generally decreases away from the focus, or center, of the earthquake.

Soil conditions can influence the ground shaking that would occur during an earthquake. The degree to which soft ground conditions may amplify shaking from earthquakes can be estimated by determining site seismic class. Seismic site classes range from Class A to Class F with increasingly softer soil conditions and corresponding increases in amplification of earthquake shaking. The project area crosses various classes of seismic soil conditions from Class B near the Port Angeles Substation and converter station site to Class E along the shoreline (see Figure 3-5).

Ground surface displacement caused by an earthquake is a design consideration if a transmission line would cross active faults. More than 20 faults are documented within 10 miles (6 km) of the proposed project alignment (see Figure 3-6) (USGS 2005a; Schasse, Wegmann, and Polenz 2004). Most of these faults are within the Strait.

Although it is impossible to predict when or where earthquakes may occur or how big they will be, the probability of an earthquake of a given size occurring at a given location within a certain time can be estimated based on information on historical earthquakes, locations of faults, and observations of present crustal deformation. In the project area, an earthquake could occur during the life of the project (USGS 2005b).

Liquefaction

Soil liquefaction is a phenomenon that can occur when loose, water-saturated bodies of sand, silt, or gravel are subjected to strong ground shaking. During liquefaction, the sediment grains become rearranged; the sediment loses internal strength and then behaves like a liquid (e.g., quicksand). The liquefied sediment may flow out of the ground surface (as sand boils, sand blows, or sand volcanoes) or cause lateral spreading of overlying sediment layers. Ground failures, such as ground cracking or lateral spreads (landslides on very shallow slopes) commonly occur above liquefied layers. Such movement may cause damage to structures, roads, rail lines, and utilities. The likelihood and effects of soil liquefaction depend on several factors including the intensity of ground shaking; physical properties of the sediments, such as grain size, sorting, and moisture content; and the slope of the terrain. Lateral spreading failures can occur on slopes as gentle as 0.5 percent, and flow slides can occur on 5 percent slopes, when subject to liquefaction.

Within the project area the estimated susceptibility to liquefaction ranges from very low to high (Palmer et al. 2004c). The area rated as high roughly corresponds to the shoreline near the Rayonier pulp mill site, which is underlain by fill and the Beaches soil type (USDA SCS 1987). The only project facilities within this potential inundation area would be the HDD hole, which at this location is expected to be within bedrock.

Tsunamis

Tsunamis are sea waves generated by rapid displacement of a large volume of sea water, resulting from vertical faulting or warping of the seafloor, from large-scale submarine slides, or from volcanic eruptions in or near ocean basins. In the open ocean, these waves are spaced far apart and travel at speeds up to hundreds of miles per hour. As a tsunami approaches the shoreline, the speed of the wave decreases and the wave height increases, resulting in potentially destructive effects. Historical records indicate that the severity of tsunami-generated damage varies greatly depending on factors such as coastal topography, the existence of off-shore islands, and the direction of the oncoming waves.

The Washington coastline is at risk both from distantly and locally generated tsunamis. Recent geologic investigations indicate that multiple very large earthquakes (magnitude 8 or greater) have occurred in the Cascadia subduction zone west of Washington. Computer models indicate that tsunami waves generated by these local events might range from 5 to 55 feet (1.5 to 17 m) high and could affect the entire coastal region (DGER 2005).

A portion of the project area along the coastline could be inundated during a large tsunami (Walsh, Myers, and Baptista 2002). However, the project facilities within this potential inundation area would be underground (the HDD hole).

Slope Stability and Seafloor Mobility

The bluff area at the north end of Liberty Street has been mapped by Clallam County as a landslide hazard and erosion hazard zone (Clallam County 2005).

A marine geophysical survey of the proposed transmission line route was conducted in July 2005. The survey did not identify areas of potential submarine slope instability in the immediate project area. The survey, however, did find areas of large sand waves. Sand waves are naturally-occurring seafloor sediment features that resemble sand dunes. These features are actively migrating to the east (Terra Remote Sensing, Inc., 2006).

Erosion

Erosion of soils and rock is a normal geologic process. Under certain conditions, such as steep slopes or heavy rainfall, the process of erosion is accelerated, resulting in a geologic hazard that could cause removal of excessive material and sedimentation in sensitive areas.

The soils mapped in the project area have a slight soil erosion hazard. The coastal bluff is mapped as an erosion hazard zone by Clallam County. The marine bluff has mapped landslide zones and mass wasting deposits, and may be subject to slope failure in the future (Schasse, Wegmann, and Polenz 2004; Clallam County 2005).

3.5.2 Environmental Impacts – Proposed Action

The project could affect soils by moving soils to other areas, including contaminated soils; changing soil composition through the addition of bentonite; exposing soils to rain and causing erosion; compacting soil; or removing soil from use either by taking it off-site or covering with impervious areas.

3.5.2.1 Marine DC Cable

Trenching to lay the marine cable, and to a lesser extent prop-wash in the Harbor, would disturb the sea floor (see Section 3.1.2.1). For the Strait, an estimated 22,000 to 145,000 yards^3 (17,000 to 111,000 m^3) of sediment would be disturbed. These soil disturbance estimates for the Strait are based on a 4-foot (1.2-m) wide by 3-foot (.9-m) deep trench and a 16-foot (4.8-m) wide by 5-foot (1.5-m) deep trench. The actual size of the trench across the Strait would vary between these given ranges depending on the type of sea floor bottom encountered during trenching. In the Harbor an estimated 43,000 yards^3 (33,000 m^3) of soil would be disturbed, based on a 16-foot (4.8-m) wide by 12-foot (3.7-m) deep trench. In all disturbance scenarios, most of the sediment disturbed (80 to 90 percent) would fall back into the trench or rest on the sea floor near the trench after the cable is laid.

About 10 to 20 percent of the disturbed sediment (about 2,000 to 29,000 yards^3 [1,700 to 22,000 m^3]) would be dispersed over a wide area, up to about 0.5 mile (0.8 km) from its original place on the sea floor. Because most sea floor sediment would remain in or near its original location, impacts to sediments due to disturbance and dispersal during trenching would be ***low-to-moderate***.

Trenching activities would also disturb marine sediments contaminated by releases from historic operations at the Rayonier pulp mill. As described in Section 3.1.1.1, most recent contaminate monitoring and sampling in the Harbor found contaminates (4-methylphenol, pesticides, and resin acids) at concentrations within Washington state sediment standards. The sediment disturbance caused by trenching and prop-wash in the vicinity of the Rayonier pulp mill outfall could spread existing contaminates up to 0.5 mile (0.8 km) from sea bed activities. Contaminants disturbed could fall back to the sea floor in an already contaminated area, disperse to another area already contaminated, or disperse to an unpolluted area. If contaminants are moved to an already polluted area, levels in this area could be raised above state standards. Any contaminants dispersed to unpolluted areas would be expected to be in small enough quantities that the new area would also be within Washington state standards. Impacts to soils due to potential redistribution of existing contaminates would be ***low-to-moderate***.

The marine cable may cross areas of large sand waves. If the sand waves are active (i.e., the sand material is moving slowly as a result of currents), potential impacts on the cable could include: deposition of sand over the cable, resulting in deeper burial; or erosion of sand over the cable, resulting in a thinning or removal of sediment cover. If the sediment cover is removed, there could be stresses on the cable.

No known areas of slope instability within the marine portion of the project area have been identified along the route (Archipelago 2005).

If an earthquake occurred, the cable could potentially be severed, at which time the power would automatically and instantaneously shut off.

The potential for damage due to a large tsunami is low due to the underground location of the cable in the potentially inundated area. It is possible that a tsunami could move sediments, including those burying the cable. It is not anticipated that the cable would be harmed as a result of such sediment movement or associated water movement.

3.5.2.2 Horizontal Directional Drill Hole

At the HDD hole end point in the Harbor, sediments around the hole would be excavated to allow the cable to enter the hole at a soft angle and to catch drilling fluids and cuttings that leave the hole. About 40 yards^3 (31 m^3) of soil would be removed and placed on a barge until the drilling process is done, then used to refill the area. A clam-shell type crane would remove the soil and place it on the barge. Much of the sediment would disperse as the soil is brought from a depth of about 30 feet (9 m) up to the surface. Because of the location, this soil would include contaminated sediments, though the contaminate levels are within state standards. As with the trenching activities in this area, sediment and existing contaminates could travel up to 0.5 mile (0.8 km) from the excavated area. The impacts of the HDD excavation would be similar to the trenching, with disturbed contaminants potentially falling back to the sea floor in an already contaminated area, dispersing to another area already contaminated, or dispersing to an unpolluted area. Because the level of existing contamination is low but unpolluted areas may be affected, impacts to soils from potential redistribution of existing contaminates would be ***low-to-moderate***.

HDD hole construction could accidentally cause a release of drilling mud to the surface if the pressure of drilling muds in the borehole induces a fracture, or opens up a previously existing fracture, that reaches the surface. If there was an accidental release of drilling muds, the muds would be contained and cleaned-up, where possible.

Discharge of drilling mud and drill cuttings (rock and soil materials generated by the drill bit) also would occur at the HDD hole end point as the drill bit reaches the seafloor surface. The volume of drilling fluids discharged, combined with drill cuttings, would be between 6.5 and 94 yards^3 (5 and 72 m^3). Some of this discharge would settle into the excavated hole around the HDD hole end point and be removed through a vacuum.

Whether during an accidental release or as the drill bit reached the seafloor in the Harbor, it would not be possible to remove all the released drilling muds and some would become part of the soil or sediment make-up. Bentonite (the principle substance of the drilling fluids, along with water) is a naturally-occurring clay and when mixed with other soil could change the composition of the soil in the immediate area. However, because any release of bentonite would be relatively small and would mix in with the existing soils over time, and because bentonite is a non-toxic soil type, drilling mud releases would not affect soil productivity. Impacts to soils from the release of drilling muds would be ***low***.

On land, the construction of the HDD hole would disturb soil and remove soil. Under the surface of Liberty Street where the hole would start about 2 yards^3 (1.5 m^3) would be excavated. Most of the soil would be replaced after construction is complete and the excess soil *would* be removed and disposed of at an appropriate landfill. Piles of soil could be subject to erosion if it rained during construction; however, standard erosion control measures would include covering soil piles during heavy rain.

During the drilling operation, soil cuttings from the hole would be removed and taken to a suitable landfill or spoil disposal location. About 215 yards^3 (165 m^3*)* of drill cuttings would be removed for the 3,300-foot (1,000-m) long hole. Impacts from soil removal during the HDD hole construction would be ***low***; only a small amount of soil would be removed at the construction site, which would be repaved, and the soil removed from the hole would be a relatively small core over a long distance.

During construction, paleontological resources (i.e., plant or animal fossils) may be encountered deep under overlying sediments. The drill hole would be between 130 and 220 feet (40 and

65 m) deep and would extend as far as 3,300 feet (1,000 m) from the HDD-hole construction pad. The depths of the geologic unit(s) that may contain paleontological resources vary throughout the project area. However, because of the small diameter of the bore (between 12 and 18 inches [30 and 46 cm]) the likelihood of encountering such resources is low. Impacts would be ***low***.

Although the marine bluff has potential for landslides; the HDD hole would be in bedrock below this area. The HDD hole construction would not increase the potential for a landslide nor would the cable be susceptible to exposure if one occurred. There would be ***no*** impact to landslide potential due to the HDD hole construction.

The HDD hole crosses an area subject to possible inundation by tsunamis. However, the cable inside the HDD hole would not be subject to potential damage from inundation.

The HDD hole would be in the area with high liquefaction susceptibility, but much of the hole would be within bedrock, and would not be affected by possible liquefaction of the overlying fill. The portion of the hole that would be in soil, prior to reaching bedrock, could be affected by possible liquefaction during an earthquake.

3.5.2.3 Terrestrial DC Cable

Terrestrial DC cable trenching is proposed for areas previously impacted by the construction of Liberty Street and the installation of existing utilities. The road surface and the soil underneath would be removed to place the cable in the trench, then at least some of the soil would be returned to the trench. Piles of soil could be subject to erosion if it rained during construction; however, standard erosion control measures would include covering soil piles when appropriate. Excess soil would be hauled off-site. The impact to soils along the terrestrial cable trench, including removal of excess soil would be ***low***.

It is unlikely that paleontological resources would be encountered and disturbed during trenching because most of the area has been previously disturbed. Impacts would be ***low***.

The terrestrial DC cable could be damaged during an earthquake. Damage could be minor to severe, depending on the severity and location of the earthquake and if the soil liquefies. The terrestrial DC cable is in an area that has a very low to moderate potential for liquefaction and a low potential for landslides.

3.5.2.4 Converter Station

Construction of the converter station would disturb soil on about 3.75 acres (1.5 ha) of the site. Soil work would include vegetation and tree clearing activities, potentially digging 5 feet (1.5 m) below grade for the building, burying or constructing new towers for existing transmission lines that cross the site, and grading to create the electrical yard surface. Up to about 1000 $yards^3$ (765 m^3) of soil would be removed from the site during grading and excavation. The mapped soil types at the site are characterized as having a slight water erosion hazard (USDA SCS 1987). However, excavation and other construction activities that disturb the soil by changing the ground slope may cause soils to become temporarily more susceptible to water erosion. During construction, the site would be exposed to erosion if rained upon. Standard erosion control measures would help contain soil on site.

The soil in the 3.75 acre (1.5 ha) portion of the converter station site would be compacted through vehicle traffic and grading activities and then covered by either the building or a graveled electrical yard. Soil compaction and coverage may reduce the soil's ability to absorb precipitation, thereby increasing runoff (See Section 3.1, Water Resources). The periodic use of herbicides on the gravel electrical yard could change soil microorganisms in this area.

Overall impacts to soil at the converter station site from removal, compaction, and possible change in microorganisms would be ***low-to-moderate***.

Paleontological resources could potentially be encountered and disturbed during excavation work at the converter station. There has been some previous disturbance of the site during construction of the existing transmission line towers on the property, so resources are not likely to be found. Impacts would be ***low***.

3.5.2.5 Terrestrial AC Cable

Terrestrial AC cable trenching is proposed along Porter Street for part of the cable's length. Porter Street has been previously impacted by construction and the installation of existing utilities. The road surface and the soil underneath would be removed to place the cable in a trench, then the trench would be backfilled with insulating material close to the conductors and native soil on top. Excess soil would be removed. The impacts to soil along the AC cable route within Porter Street, including removal of excess soil, would be ***low***.

Where the terrestrial AC cable leaves Porter Street and enters BPA substation property, a trench would be dug in existing soil and would require the removal of trees and other vegetation. Options A and B would have similar impacts to soils. For both options, the trench would be dug and after the AC cable is laid in place, the trench would be backfilled with insulating material close to the conductors and native soil on top. Excess soil would be removed. The area cleared of vegetation would be exposed to erosion during rain events until such time that low-growing vegetation grows back to hold soil in place. Soil erosion could occur if construction takes place during wet months. However, the disturbed area would be small, and erosion control measures would be used to limit runoff. Impacts would be ***low***.

Where the fiber cable would be laid in a trench separate from the AC cable off Porter Street and to the relay house, there would be additional impacts to soil. These impacts would be similar to the impacts of the AC trenching, but the trench would be smaller and the amount of soil removed would be less. Where the fiber cable would be drilled under Park Avenue, very little soil would be disturbed. Overall impacts to soil would be ***low***.

As with other components of the project, paleontological resources could be encountered during trenching for the AC cable or fiber optic cables. However, the areas of trenching have been disturbed by previous road or utility work and impacts would be ***low***.

3.5.2.6 Port Angeles Substation Interconnection

Soils at the interconnection site would be disturbed during grading and terracing for the electrical yard and during tree clearing around the new yard. About 2 acres (1 ha) of existing grasses and shrubs would be removed for the electrical yard. Because the site slopes, terracing for the electrical equipment would require the excavation of about 20,000 $yards^3$ (15,000 m^3) of soil. Most of this soil would be used on site, just repositioned to level various sections of the yard, though some soil may be removed and disposed of off site.

The soil type in the area has a slight water erosion hazard (USDA SCS 1987). During construction, the site would become temporarily more susceptible to water erosion. Standard erosion control measures would help contain soil on site. Depending on whether construction would take place during the rainy season, a temporary retention pond may need to be built to retain stormwater run-off. The retention pond would likely require surface soil to be removed. After construction, the soil would be replaced and the area would be put back to original grade.

After grading of the entire site, the ground in the area of the electrical yard would be compacted and covered in a layer of rock. The soil would no longer be allowed to grow vegetation and water absorption would be lessened. Periodic herbicide treatment to keep vegetation from growing in the electrical yard may change the make-up of the microorganisms in the soil under the graveled yard. Construction could also alter groundwater movement in the soil so that the soil strength would be changed and slope stability would be reduced. Impacts to soils in this area would be ***low-to-moderate***.

Tree clearing, tower construction, and access road improvement would potentially result in compaction and relocation of soils. A total of about 3.5 acres (1.4 ha) of trees would be cleared, some on the west side of the yard and some on the east side. Tree clearing would rearrange soils in the area through equipment traffic, tree skidding, and stump removal (though most stumps would likely be left in place).

Soils on the west side of the property would also be disturbed where the transmission line tower would be removed and rebuilt, as well as where the existing access road entering the site would be improved. This work would disturb topsoil and cause soil compaction, making it more difficult for plants to grow back and decreasing the soil's ability to absorb precipitation, thereby increasing runoff. The removal of plant roots also exposes soil to more movement during rain. Standard erosions control measures would be implemented (see mitigation measures) and areas of disturbance (that are not graveled) would be revegetated with low-growing plants. Impacts to soils in these areas around the new electrical yard would be ***low-to-moderate***.

3.5.3 Mitigation Measures

- Limit site disturbance to the minimum area necessary to complete construction activities to the extent practicable. (Mitigation measure also listed in Water Resources Section.)
- Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to lessen soil erosion and improve water quality of stormwater run-off. (Mitigation measure also listed in Water Resources Section.)
- For the SWPPP, use management practices contained in the Storm Water Management Manual for Western Washington (e.g. use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices, placing prior to the onset of the rainy season and monitoring and maintaining until disturbed areas have stabilized). (Mitigation measure also listed in Water Resources Section.)
- If needed, develop temporary retention pond (a vegetated swale, a shallow excavation, or a combination of detaining systems) to contain turbid stormwater during construction at the Port Angeles Substation. (Mitigation measure also listed in Water Resources Section.)
- Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for short and long-term erosion. (Mitigation measure also listed in Water Resources, Vegetation and Wetlands, and Air Quality Sections.)
- Cut or crush vegetation, rather than blade, in areas that will remain vegetated in order to maximize the ability of plant roots to keep soil intact. (Mitigation measure also listed in Vegetation and Wetlands Section.)
- Install trip switches in the converter station to automatically shut off power at the station in the event of strong ground shaking during a seismic event that could damage the transmission system.
- Include engineered design and earthquake-resistant construction in all habitable structures to increase the safety of persons occupying the buildings. The minimum seismic design would comply with the Clallam County Building Code and applicable Washington State Building Codes.
- Design and construct non-habitable project components using earthquake-resistant measures.

3.5.4 Unavoidable Impacts Remaining After Mitigation Measures

Soils would be disturbed. Some soil would be removed and disposed of in other areas, either as fill material or in landfills with other construction debris. At the substation expansion site and the converter station site, soil would be compacted from construction activities and also to form the terracing required at the substation expansion site.

During construction, there is a potential for some paleontological resources to be disturbed or destroyed. The potential is low that these resources would be affected.

More of the landscape would be covered with impermeable material, rock and gravel and compacted soil where construction occurs than before construction.

3.5.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create no impacts to earth resources.

3.6 Land Use

3.6.1 Affected Environment

The project crosses both the ocean and land in northeastern Clallam County and the City of Port Angeles, Washington (see Figure 2-1). This section describes jurisdiction, zoning, ownership, and land uses along the project corridor.

The marine portion of the proposed project (within the U.S.) is in the jurisdiction of Clallam County. The county does not have zoning classifications for this marine area (Emery 2005). Ownership of this marine area, the tidal and seabed lands, is held by Washington's Department of Natural Resources. The waters in the Strait, above where the proposed marine cable would be trenched, are used by both commercial and pleasure craft. Use of the harbor and waters near Port Angeles is described in Section 3.8, Socioeconomics.

The land portion of the proposed project is in the jurisdiction of the City of Port Angeles and has various zonings classifications. Land potentially affected by the project is owned by the City, Clallam County, private landowners, the state and the federal government. Land uses include industrial, commercial, residential, recreational, transportation and utility purposes. Some land is protected as environmentally sensitive.

3.6.1.1 Residential

The predominant land use near the HDD hole construction site, the terrestrial DC and AC cable routes, and near or next to the converter station site and BPA's Port Angeles Substation is residential, single-family detached homes (see Figure 3-7). North of the converter station site the residential areas are zoned "low-density residential" (Residential Single Family RS-7). Low-density residential allows an overall housing project or property to range up to seven units per acre and is intended for the development of single-family homes (City of Port Angeles 2004). The land west of the converter station site and the substation expansion site is zoned residential, medium density. Medium density residential allows up to 13 units per acre and the primary intent of this designation is for the development of multiple residential unit projects including but not limited to duplexes, townhouses, condominiums, apartments, and planned residential developments (City of Port Angeles 2006).

Types of housing stock vary from modest to expensive single-family residences, some with views of the Strait and the Olympic Mountains. Age of the housing stock also varies, with for example, older homes on North Liberty Street and two new homes built across from Port Angeles Substation.

3.6.1.2 Commercial

The project corridor intersects U.S. Highway 101, where commercial development occurs. Commercial retail, for example restaurants, a butcher shop, car rental, and other retail businesses, border the project route along the Highway 101 corridor. An assisted care facility is located on the west side of the proposed converter station site. A day-care center in a single-family home on Liberty Street is located about 2 blocks north of the HDD hole construction site. A church is located on Front Street about 2 blocks south of the HDD hole construction site.

3.6.1.3 Industrial

The top of the bluff at the end of Liberty Street is zoned Industrial Light and the marine waters beyond the shoreline to the outer harbor are zoned Industrial Heavy. These areas are not presently being used for industrial purposes.

3.6.1.4 Public Buildings and Parks, Environmentally Sensitive Land and Recreation

A portion of the Olympic Discovery Trail follows the waterfront along the Port Angeles Harbor (see Figure 3-7). The trail is used for hiking, walking, jogging, biking and sightseeing. The proposed HDD hole would run under this trail.

The marine bluff at the end of Liberty Street that the HDD hole would be drilled under has been designated as an Environmentally Sensitive Area by the City of Port Angeles because of its landslide potential (see Figure 3-7). The area is vegetated and used as open space.

The Port Angeles Community Playhouse, a community theater and arts facility, is north across East Lauridsen Boulevard from the converter station site.

The proposed converter station site and the existing BPA Port Angeles Substation are on land zoned Public Buildings and Parks. The proposed converter station site is owned by Clallam County PUD and is presently used primarily as a transmission line right-of-way. Four transmission lines cross the property; two of the lines are owned by the City of Port Angeles and two are owned by Clallam County PUD. The parcel is also used for casual recreation such as walking.

BPA's Port Angeles Substation occupies about half of BPA's property just south of the converter station site. The substation and the transmission lines that run in and out of the substation are the main use of the property. The proposed substation expansion area is undeveloped BPA land directly south of the existing substation. This area is also used for casual recreation such as walking.

Next to the converter station site and Port Angeles Substation is Peninsula College, a state-run community college.

3.6.1.5 Utilities

Electricity

BPA transmits power to Port Angeles via its transmission lines to its Port Angeles Substation. From the substation, Port Angeles City Light and the Clallam County PUD serve area residents and customers. The Clallam County PUD provides electrical service to over 25,000 customers and has offices in Port Angeles, Sequim, Forks, and Clallam Bay/Sekiu. Port Angeles City Light serves 9,780 customers over 9 miles (14.5 km) of transmission, 103 miles (166 km) of overhead distribution, and 26 miles (42 km) of underground distribution with seven substations within its 13-square mile (21-square km) service territory. The project area has both overhead and underground lines.

Water

The City of Port Angeles Public Works Department maintains about 189 miles (304 km) of pipe ranging from 2 to 30 inches (5 to 76 cm) in diameter. The system also includes three water booster pump stations, five reservoirs, and about 7,928 service connections. Water is obtained from a well adjacent to the Elwha River. The city also operates 12 miles (19 km) of 48-inch (122-cm) pipe that provides untreated water to waterfront industrial users. The water is treated by those users to meet their needs (City of Port Angeles 2005a).

Wastewater

The City of Port Angeles Public Works Department maintains about 117 miles (188 km) of sanitary and combined sewers, ranging from 4 to 48 inches (10 to 122 cm) in diameter, with 7,200 service connections. The system also includes 10 pump stations and a secondary wastewater treatment plant. From East 5th St to Lauridsen Boulevard, there are two sewer lines that run along the street (Partch 2006). Along the rest of the route, there are about 35 utility pipe crossings (water and sewer).

Stormwater

The City of Port Angeles Public Works Department maintains 65 miles (105 km) of stormwater mains (separate from the sanitary sewer) and provides collection and treatment of stormwater from residential, commercial, and industrial users. The stormwater infrastructure in the vicinity of the terrestrial portion of the proposed project is near capacity.

Solid Waste

The City of Port Angeles Public Works Department operates and maintains the solid waste collection system, including a landfill and compost facility, and contracts with Waste Management for recycling. The landfill accepts solid waste from the city and Clallam County. The city is currently servicing 6,600 residential and 750 commercial accounts per week.

Natural Gas

There are no operating natural gas lines in the City (Partch, July 2006).

3.6.1.6 Transportation

Port Angeles has an integrated transportation system, consisting of the William R. Fairchild Airport, the Port of Port Angeles, Highway 101, the Clallam County Transit system that provides bus service, and car and passenger ferry service to Vancouver Island. William R. Fairchild Airport offers regular service to Boeing Field and SeaTac International Airport. According to the Regional Transportation Planning Organization (RTPO), Highway 101 is the only highway of statewide significance in Port Angeles. The only designated truck route in the city is the Front/First Street Couplet to Tumwater Truck Route (SR 117) to U.S. 101.

The waters of the Strait are a major transportation corridor (see Section, 3.8 Socioeconomics). The City of Port Angeles was platted with the street rights-of-way in place, and so the streets have no zoning designation. Placement of utilities in city streets is through approval by the City of Port Angeles Public Works Department.

The proposed terrestrial DC cable route passes largely through a typical residential road network, with wider streets (~20 feet [6.1 m] wide) north of Highway 101 and narrower streets (~15 feet [14.6 m] wide) south of Highway 101. Most of the streets in the project vicinity, with the exception of Highway 101, have lower traffic volumes typical of urbanized residential streets. In general, traffic on these streets is heaviest during morning and evening commute hours. These streets are primarily used by area residents, but also receive traffic from delivery trucks, tourists, and other sources.

Traffic along Highway 101 is split between adjacent blocks as it passes through Port Angeles, with traffic heading west proceeding along Front Street, and traffic heading east proceeding along First Street, which is a block south of Front Street. The cable route would also cross East Lauridsen Boulevard in the vicinity of the converter station. This is a major east-west thoroughfare in the City.

U.S. Highway 101 carries large amounts of traffic throughout the Olympic Peninsula area. The City does not have traffic counts at Liberty Street (Mahlum 2006). However, counts do exist at Ennis Street (one block east): Front Street (west of Ennis) 21,675 Average Daily Traffic (ADT in 2003), First Street (west of Ennis) 23,925 ADT (in 2003) (Mahlum 2006). The speed limit of both streets is 35 mph (56 kph).

Bus service is provided by Clallam Transit along the College/Plaza Route (Route 20) within Port Angeles. Buses run a counter-clockwise circuit through the City. Buses run east along Lauridsen Boulevard reaching Peninsula College every half hour between 6:30 AM to 6:30 PM, Monday to Friday, and every hour between 7 AM and 6 PM on Saturdays. Buses then turn north on 5th Street/Ennis Street, which is one block east of the proposed cable route.

3.6.2 Environmental Impacts – Proposed Action

3.6.2.1 Marine DC Cable

The proposed construction in the harbor and marine waters would potentially create temporary impacts to fishing and ship traffic because captains would need to avoid the slow moving cable-laying operations (also see Section 3.8, Socioeconomics). Harbor operations would only be temporarily impacted because cable laying operations would be transient (2 to 3 days of total time needed in the Harbor to lay the cable), and there would be sufficient room around the cable-laying ship for incoming and out going vessels including local ferry traffic. Because the cable would be buried or protected, there is little possibility of anchors striking the cable (see Section 3.11, Health and Safety). Overall there would be ***no-to-low*** impacts to the short-term and long-term use of the Strait and Harbor.

3.6.2.2 Horizontal Directional Drill Hole

HDD hole construction would create localized impacts. Nearby residents would be affected by construction noise, dust, night-time lighting, and traffic disruptions. Roads would be closed during daylight hours and driveways would be blocked intermittently. Liberty Street would be closed from Caroline Street to Georgiana Street for the duration of the HDD operation.

Diesel-powered generators would emit fumes and noise. See Section 3.10, Noise for impacts due to noise. Because the HDD operations would take place 24 hours/per day, 7 days a week for about 23 days, residents in the vicinity of the HDD hole construction site would be impacted day and night as well as on weekends. The day care center in a single-family home may be temporarily disrupted by the noise, dust, fumes and traffic disruptions created by construction. Church services may be temporarily disrupted. Temporary impacts to land uses in the immediate vicinity would be ***moderate-to-high***. Once the HDD hole work is completed, there would be no change to land use; ***no*** long-term impacts would occur. See also Sections 3.1, 3.9, and 3.11.

The HDD hole would be drilled under the marine bluff at the end of Liberty Street. The HDD hole has been designed and sited to avoid the area along the bluff that could be subject to a landslide, and the cable would be deep enough so it would not be impacted by a future landslide.

3.6.2.3 Terrestrial DC Cable

The proposed DC cable trench construction would occur in existing streets. Trenching along Liberty Street is expected to progress at a rate of one block per five days (Wise 2006) during day time hours. Construction would create temporary impacts to nearby residents and visitors from noise, road closures, and decreased air quality (see also Sections 3.1, 3.9, and 3.11). Short-term impacts would arise from lane closures and detours on Liberty Street and the affected cross streets in the construction area and the addition of construction vehicles and vehicles transporting construction materials to local roadways. The construction lane closures would follow city-imposed requirements. During construction one lane of Liberty Street would be closed. Local residents could access the area via Ennis Street (east) or Jones Street (west) (see Figure 3-7).

Sea Breeze or its construction management company would coordinate driveway access with each home owner to minimize any closures during construction. Driveways with entrances on Liberty Street occur mainly in the more southerly portion of the route.

U.S. Highway 101 and East Lauridsen Boulevard (highway and bus traffic) would not be closed during construction. The cable would be bored under these streets with HDD construction technology.

Light construction traffic would cross U.S. Highway 101 during construction to deliver materials. U.S. Highway 101 would be the primary route to the project site for construction vehicles and hauling of construction materials. Traffic impacts associated with construction vehicles would be ***low*** because of the temporary nature of the construction process. No road closures or detours would be required on U.S. Highway 101. Impacts to Highway 101 would be ***low***.

Construction-related vehicles and equipment would use the specified materials staging area located at the proposed site for the converter station. There would be some disruption to traffic and access along Liberty Street and some cross roads because of the trenching activities. However, flaggers and traffic-control devices would minimize localized impacts by keeping traffic moving on Liberty Street and other streets in the affected area.

Streets would be repaved after construction is complete and residents and visitors could resume travel and original traffic patterns on the roads. Impacts would be temporary and ***moderate***.

Residents in the area along Liberty Street up the hill between 5th and 8th streets would be subjected to additional noise from the blasting required within the street in this area (see Section 3.10, Noise). Temporary impacts would be ***moderate***.

Wherever feasible, the proposed cable would be placed below the level of existing utilities to protect the cable from maintenance work on the existing utility lines or installation of new utility lines. The exact depth of the cable would be determined in cooperation with Port Angeles Public Works engineers once the final alignment has been determined. However, the cable would likely not be placed deeper than about 6 feet (2 m) since this depth affects design and installation (Wise 2006). The proposed cable would be located no closer than about 12 inches (30 cm) from existing utility lines (Sea Breeze 2005 [Certificate of Public Convenience and Necessity Application]). Methods used to avoid impact to existing utilities include obtaining as-built plans of the existing lines from the City Public Works Department to locate the existing utilities, and, during construction, excavating by hand when close to the existing utilities. If damage occurs in spite of these avoidance measures, repairs would be made as soon as feasibly possible.

With the possible exception of water service in the portion of the project south of U.S. Highway 101, no disruption to existing utility service is expected to be necessary during construction. If water service disruption is required, Sea Breeze would follow City-specified requirements to ensure that backflow would not occur. Impacts, if they occur, would be temporary and ***low***.

If the cable breaks, the converter station would cut the flow of power in the line in a fraction of a second (less than 1/30th of a second, or two cycles at 60 Hz). The remaining energy in the cable would go from the inner core of the cable to the outer sheath, which is grounded. As a result, the energy in the cable would be used up by melting the plastic insulation. Mechanical protection above the cables would be installed, where necessary, to protect the cables from damage (Wise 2006). Impacts, if they occur, would be ***moderate***.

During operation, workers performing maintenance on other utilities near or over the trench would have to use caution. Though the City will have detailed as built plans of the location of the cable, crews would need to spend more time with the plans to make sure their work does not disrupt service. Such measures are common near many types of sensitive underground utilities, for example, fiber optic cables and natural gas pipelines. This would be a long-term ***low*** impact.

Installation of the cable under city streets is consistent with the existing use of these streets as utility corridors. The cable, like the other utility lines currently under the city streets, would not conflict with adjacent land uses. ***No*** long-term impacts to heavy industrial, residential, and day care uses of the land would occur as a result of the project.

Minimal long-term impacts would occur. Occasional repairs to the cable could interrupt traffic and inconvenience residents, but would be rare and short-term; the terrestrial DC cable would create ***no-to-low*** long-term impacts to land use.

3.6.2.4 Converter Station

Because the converter station site is zoned for public utilities, the proposed use is compatible with the existing land use designation and would not conflict with the approved Comprehensive Plan for the City of Port Angeles (2004).

The converter station site would change from a nearly vacant lot used for electrical transmission right-of-way and open space to a converter station, and would incrementally increase the utility-related use of the area. Some existing trees and vegetation would be removed and the station would be fenced, so some casual recreation would be lost. Impacts would be ***moderate***.

Although development of the converter station building would create an impervious area that would potentially impact the City's stormwater facilities, mitigation measures would minimize or avoid this impact (see Section 3.1).

Residents near the converter station site and residents and visitors to Peninsula College, the community theater and other facilities would experience short-term impacts from construction including potential disruption in access; these impacts would be temporary and ***moderate***.

3.6.2.5 Terrestrial AC Cable

Trenching of the AC cable under the street would create noise, road closures, decreased air quality, and impacts to existing utilities similar to the impacts from the DC cable trench construction. Residents in this area may need to use alternate routes and be subject to noise for the approximate 21-day construction period. Streets would be repaved and would revert to their existing use and traffic patterns would be restored. Impacts would be temporary and ***moderate***.

Where the cable would be trenched on BPA property, all trees would be cut. Construction would have similar impacts, except traffic disruption would be less than when the work would occur in the street. Low-growing vegetation would be allowed to grow over the trenched area, but no large trees would be allowed. Impacts would be ***low.*** The routing Option A onto BPA property would have fewer land use impacts to BPA than Option B because the line would stay within Porter Street for a longer distance and enter the property perpendicularly. Option B would angle across the property eliminating potential future use of this area.

Installation of the fiber cable under Park Avenue would have less impact than the AC cable trenching in the street; the fiber cable route is very short and the cable would be drilled under the street, so traffic would not likely be disrupted. Impacts would be temporary and ***low***.

Impacts from installation of the fiber cable on BPA property would be similar to the AC cable trenching on BPA property except that there are no trees that would need to be removed in this area.

3.6.2.6 Port Angeles Substation Interconnection

Because the existing substation site is federal property and is zoned for public utilities, expansion of the substation for the interconnection would be consistent with city zoning. The land use of the expansion area would change from existing open space and transmission line corridor to enclosed, fenced substation yard, and transmission corridor. The expansion would incrementally increase the utility-related use of the area. Some existing vegetation and trees would be removed from the area and the substation expansion would be fenced, restricting access for casual recreation. Impacts would be ***moderate***.

The development of the relay house would create an impervious area that would not be large enough to impact the City’s stormwater facilities (see Section 3.1).

Residents near the substation would experience short-term impacts from construction including potential disruption in access; these impacts would be temporary and ***moderate***.

3.6.3 Mitigation Measures

- Notify residents and business owners of the construction schedule, potential impacts, and contact numbers for project managers who can provide information or address concerns during construction.

- Contact residents along the route prior to construction in order to coordinate driveway access and reduce interference.
- Provide appropriate signage for redirecting traffic during construction through coordination with the City of Port Angeles Public Works Department.
- Implement measures to reduce visual and noise impacts (see Visual and Noise Sections).

3.6.4 Unavoidable Impacts Remaining After Mitigation Measures

Residents and businesses would be temporarily impacted by noise, dust, road closures, and air emissions from construction activities, especially in the vicinity of the HDD hole construction site. Local transportation patterns would be changed to avoid construction. The converter station site would be changed permanently to an industrial setting with restricted access for casual recreation. The Port Angeles Substation expansion would also change the existing casual recreation use, reduce access, and increase the industrial element in the local neighborhood.

3.6.5 Environmental Impacts – No Action Alternative

No temporary or permanent changes to land use would occur. The converter station site and substation expansion site would most likely remain open space, but could be developed in the future. The No Action Alternative would create ***no*** impacts to land use.

3.7 Visual Resources

3.7.1 Affected Environment

3.7.1.1 Setting

The Port Angeles area has a wide range of natural and manmade features that contribute to its setting. Port Angeles is the gateway to Olympic National Park, with the Olympic Mountains rising to the south, visible from many locations in the city. The city is on the Strait and has open shoreline and beaches within the city, a waterfront trail and a busy commercial harbor. Ferry service is available across the Strait to Victoria, Canada. The access to marine and alpine environments makes the area a destination for many tourists.

The proposed project area has many landscape types: marine shorelines, bluffs, flat benches cut by narrow, wooded drainages, and gentle rolling foothills. Ocean and mountain views are available from many of these landscapes. Elevations range from sea level to about 350 feet (106.7 m).

The proposed project route is through marine, industrial, residential, and commercial areas of Port Angeles. In the immediate area of the project, views range from background views of the ocean and mountains, to moderate views of patches of urban trees, the ocean, and residential and commercial areas, to foreground views of utility, transportation and business corridors and residential homes.

The proposed project would cross U.S. Highway 101, which carries large amounts of traffic throughout the Olympic Peninsula. U.S. Highway 101 within the project area is a one-way couplet with Front Street westbound and First Street eastbound and is not designated as a scenic route, though travelers on the highway may be traveling to or from highway sections that are so designated. The speed limit on Highway 101 in the project area is 35 mph (56 kph) (Mahlum 2006). Travelers generally move quickly through this area going to other locations. Along the highway there are views of the Strait, the commercial area of Port Angeles, residential neighborhoods and the Olympic Mountains. The average daily traffic count (in 2003) was about 24,000 vehicles (Mahlum 2006).

3.7.1.2 Visual Sensitivity and Distance

The importance of a visual resource depends primarily on the sensitivity of the viewer and the distance of the resource from the viewer. Much of the project area is residential. Residents usually have a high sensitivity to changes in their visual environment, especially if the changes are in the immediate foreground or middle ground and the change is permanent or long-term. They are usually less sensitive if the change is temporary and involves a resource in the background, unless the resource is unusual and important such as an ocean or mountain view. Construction activities would be visible from many residences.

Recreationists are also highly sensitive to potential changes in the visual environment. Potential viewers from Olympic National Park and from the waterfront Discovery Trail would be considered highly sensitive. The Olympic National Park's Visitor Center is southwest of the proposed project, but homes and trees obscure the view of the project area. The proposed project would not be visible from other areas within the park, except from the tops of peaks. Views would be of great distance and in the background.

Visitors walking or otherwise using the Discovery Trail could view construction activities at the north end of Liberty Street.

Motorists traveling along Highway 101 and other nearby streets would have moderate to low viewer sensitivity. While traveling on Highway 101 and along adjacent and residential streets, motorist would have foreground views of construction activities; these views would be of short duration.

3.7.2 Environmental Impacts – Proposed Action

The proposed project would create short-term and long-term visual impacts. Construction activities and staging areas would temporarily change the views of sensitive and other viewers. Permanent buildings and equipment would create long-term impacts as they change views and create contrasts with existing buildings and landscape.

3.7.2.1 Marine DC Cable

Residents in about 10 homes along Water Street, North Liberty Street, and Columbia Street would be able to see the cable-laying ship and supporting boats and other equipment during construction of the marine cable in Port Angeles Harbor. This equipment and activity would also be visible from other residences east of the project that have water views, such as homes along Harborcrest Street. Views for these residents would be in the background. The cable-laying ship and other equipment would be similar to other ships working in the harbor and would not be out of character with existing ships and other water traffic; the impact would be ***short-term*** and ***low***.

Visitors to the Discovery Trail along the waterfront would also see the marine construction equipment. The impact would be ***short-term*** and ***low*** because the activities would not be in contrast to existing, typical marine activities.

Some viewers, either local or from other parts of the city, could come to specifically view the marine cable construction. Watching construction activities would be a short-term, positive experience for these viewers.

3.7.2.2 Horizontal Directional Drill Hole

Construction of the HDD hole would require the equipment shown in Figure 2-9 and described in Section 2.1.2. Construction would occur on North Liberty Street just south of Caroline Street. Traffic would be blocked on North Liberty Street between Georgiana Street and Caroline Street. Residents in about 12 homes on these streets would have clear foreground views of the drilling site during about 32 days of total construction time for the HDD operations. Other residents along nearby streets would see construction vehicles traveling to and from the site. The construction activities would contrast with typical neighborhood and nearby commercial actions. Views north down Liberty Street to the ocean would be blocked by equipment. Residents of the area would be sensitive viewers and impacts would be ***short-term*** and ***moderate***.

Once the HDD hole is completed, the area would be restored and there would be no signs of construction on the surface. The hole itself would not be visible. The HDD hole would have ***no long-term*** impacts to visual resources.

Visitors to the Discovery Trail along the waterfront would be unable to see the HDD hole construction site and the HDD hole would be underground. There would be ***no*** impacts to visitors along the trail. However, visitors walking or otherwise using the Discovery Trail may be able to see construction vehicles and staging activities at the north end of Liberty Street. Impacts would be temporary and ***low***.

Some viewers, either local or from other parts of the city, could come to specifically view the HDD hole construction. Watching construction activities would be a short-term, ***positive*** experience for these viewers.

3.7.2.3 Terrestrial DC Cable

Residents in about 45 homes along Liberty Street would have temporary foreground views of the cable-trenching construction activity, equipment, and material storage. Construction of the trench to lay the cable would occur during the day time. The construction would progress at a rate of about one block per five days or about 100 feet (30 m) per day (Sea Breeze 2006). Businesses along Liberty Street and Highway 101 would have similar views as residents. The construction activities would contrast with typical neighborhood and nearby commercial actions. Views north down Liberty Street to the ocean could be blocked by equipment. Residents of the area would be sensitive viewers; impacts would be ***short-term*** and ***moderate***.

During construction motorists traveling U.S. Highway 101 would have views of ongoing construction activities and equipment. These views would be limited to a few blocks on either side of the highway. Travelers along U.S. Highway 101 could also have views of the staging area where materials and equipment would be stored during construction. Because the views from motorists would be brief, with speeds of about 35 mph (56 kph) as Highway 101 passes Liberty Street, and because this area of Highway 101 is not a scenic route, impacts to motorists would be ***short-term*** and ***low***.

After construction is complete, the roadway would be repaired and would appear the same as before. The cable would be underground and not visible. The terrestrial DC cable would have ***no long-term*** impacts to visual resources.

Some viewers, either local or from other parts of the city, could come to specifically view the terrestrial DC cable construction. Watching construction activities would be a short-term, ***positive*** experience for these viewers.

3.7.2.4 Converter Station

Residents in about five homes along Liberty Street, Porter Street and East Lauridsen Boulevard would have temporary foreground views of the construction of the converter station. These views would be ***short-term*** (about 10 months) and the impact would be ***moderate***.

Residents of Peninsula College and of an assisted care facility next to the converter station site would have views of the construction of the converter station site that could be partially screened. Construction views for these residents would be in the foreground and middle ground, would be ***short-term***, and impacts would be ***low***.

Audience members and participants coming to the Port Angeles Community Playhouse across East Lauridsen Boulevard from the converter station site could view the construction if it takes place during the theater season; impacts would be ***short-term*** and ***low.***

The converter station building and electrical yard would create a long-term change in the landscape of the area. Four existing transmission lines traverse the site, crossing over from BPA's electric substation yard across Park Street. The site is treed on the west and east side of the property, providing some screening of the existing lines for some viewers. The trees also provide a screen for existing views of the parking lot at Peninsula College and the Port Angeles Substation for some viewers. These tree screens, as well as an area of thick low-growing brush and a grass field on the site, offer some visual relief in the suburban/urban environment. The grass field and low-growing vegetation on the site would be removed. The trees on the west side of the site would be partially removed, with a 100-foot wide vegetative buffer remaining. However, tall trees within the buffer that could fall into the electrical yard would also be removed, which would thin the existing buffer and lower the height of screening. Some trees on the east side of the converter station would also be selectively removed, thinning and lowering the height of the existing vegetative screen of the site from South Liberty Street.

The converter building would be 35 feet (10.7 m) tall and electrical equipment would likely be taller. If it is not possible to underground the existing transmission lines, the lines would be placed on towers about 10 to 20 feet (3 to 6 m) taller than the existing lines to cross over the converter station.

Residents in about five homes in the area would have long-term views of the converter station. Residents of Peninsula College and the assisted care facility would also have views of the station, though their view would be partially screened by trees. In addition, some views of the Olympic Mountains for about three homes on the north side of the site may be at least partially blocked by the converter station. Mitigation measures include designing the building’s exterior to be compatible with buildings on the Peninsula College campus and enclosing outside electrical equipment with a decorative wall or slatted chain link fence. Though the look of the converter station would be consistent with the existing industrial look of the existing adjacent Port Angeles Substation and transmission lines and the campus look of the colleges, the site would be permanently changed and would add another industrial element in the neighborhood.

Landscaping and other mitigation measures would also lessen the contrast with the tree buffers and would soften the industrial appearance of the converter station. ***Long-term*** impacts would be ***high*** to local residents, especially if views of the mountains would be blocked, and ***moderate*** to residents and visitors to Peninsula College and motorists.

3.7.2.5 Terrestrial AC Cable

Residents in about 15 homes along Porter and Highland streets and Grant and Olympus avenues, and residents of the assisted care facility on E. Park Street would have temporary foreground views of the terrestrial AC cable-trenching activity on Porter Street and into the BPA substation property. Some views may be screened by existing vegetation along Porter Street. The construction activities would contrast with typical neighborhood actions. Residents of the area would be sensitive viewers, but views of the construction would be temporary, about 21 days. ***Short-term*** impacts for residents would be ***moderate***.

Motorists would be able to see the construction from nearby streets. Impacts to motorists would be ***short-term*** and ***low***.

After construction is complete, the roadway would be repaired and would appear the same as before. The cable would be underground and not visible. The terrestrial AC cable in the street would have ***no long-term*** impacts to visual resources.

Visual impacts from installation of the fiber cable under Park Avenue would be ***low***: the fiber cable would be drilled under the street and drilling equipment would most likely be located on the converter station property and would probably not be distinguished from the converter station construction equipment and activities.

Construction of the underground AC cable onto BPA property would require trees to be cleared; see descriptions below for the tree clearing required for the two cable routing options entering BPA property.

With **Option A** the cable would turn perpendicular off Porter Street and onto BPA property (see Figure 2-11). Where the cable crosses the property a strip of trees and brush about 20 to 50-foot (6 to 15-m) wide would be cleared to make way for construction work. Trees would not be allowed to grow over the trench, though low-growing vegetation would. With the proposed placement of the cable route, residents along Porter Street would not have direct views of the cleared strip for the cable. Motorists on Porter Street would be able to see the cleared strip.

With **Option B**, the cable route would angle onto BPA property (see Figure 2-11). A strip of trees about 20 to 30-feet (6 to 9-m) wide would be removed along the edge of the existing wooded area. This clearing would not be as visible as with Option A, though residents near the Grant Street and Porter Street intersection may have views of the cable route, as might motorists.

For either option, the area where trees would be removed for the trench would be permanently changed because trees would not be allowed to grow over the trench. Some of these trees currently provide a screen for residents so that the substation is not visible. Without the trees these residents would be able to see the substation (see Port Angeles Interconnection discussion below about additional tree clearing in this area on BPA property). Long-term visual impacts from the terrestrial AC cable on BPA property would be ***moderate***.

Impacts from installation of the fiber cable on BPA property would be similar to the AC cable trenching on BPA property except that no trees would be removed; there would be ***no*** visual impact.

3.7.2.6 Port Angeles Substation Interconnection

Residents in about seven homes along Porter Street and Grant, Olympus and Craig avenues would have temporary foreground views of the construction activity, equipment, and material storage. Some views may be screened by existing vegetation along Porter Street. The construction activities would contrast with typical neighborhood actions. Residents of the area would be sensitive viewers, but views of the construction would be temporary (about 6 months). Construction-related visual impacts for residents would be ***short-term*** and ***moderate.***

Motorists would be able to see the construction from nearby streets. Impacts to motorists would be ***short-term*** and ***low***.

In the long-term, expansion of the substation would change the landscape from existing open space and transmission line corridor to enclosed, fenced substation yard, and transmission corridor. The expansion would add an increment of existing utility/industrial-related look to the area.

The substation yard of the expansion area would sit about 10 to 20 feet (3 to 6 m) higher than the existing substation yard. The tallest equipment within the yard would be about 76 feet (23 m) tall. The transmission line that would be moved farther west would be between 80 to 100-feet (24 to 31 m) tall.

Existing trees along the western edge of the property would be cut. Some trees would remain that are low growing (mostly deciduous trees), but most tall-growing trees (primarily Douglas fir and some alder) would need to be removed. Once removed, these trees would no longer provide a full screen between residents along Porter Street and Grant, Olympus and Craig avenues and the existing electrical yard, as well as the new expanded portion of the yard. Since the expanded portion would sit higher than the existing yard, some views across the substation toward the ocean from one or two homes on Craig Avenue may be blocked. Residents of the area would be sensitive viewers, and ***long-term*** impacts would be ***moderate-to-high***.

3.7.3 Mitigation Measures

- Seek and incorporate input from local residents and planning officials about the design of the exterior of the converter station.
- Design converter station building exterior to be compatible with facilities of Peninsula College. This could be accomplished by doing the following:
- Installing decorative walls,
- Planting native trees and understory vegetation,
- Installing slats on chain-link fencing.
- Revegetate exposed ground above underground AC lines on BPA property with vegetation that does not jeopardize safety or reliability of equipment.

3.7.4 Unavoidable Impacts Remaining After Mitigation Measures

Residents, businesses, and motorists, and recreationists along the waterfront trail would have views of the construction activities in the harbor and on land. The converter station parcel would be changed permanently to an industrial setting and residents would have screened views of the station through landscaping. The Port Angeles Substation interconnection would also increase the industrial element in the local neighborhood and residents would have increased views of the existing electrical facilities, as well as of the new electrical yard expansion.

3.7.5 Environmental Impacts – No Action Alternative

No temporary or permanent changes to visual resources would occur. The converter station site and substation expansion site would most likely remain open space, but could be developed in the future. The No Action Alternative would create ***no*** impacts to visual resources.

3.8 Socioeconomics

3.8.1 Affected Environment

3.8.1.1 Population

The City of Port Angeles is the county seat of Clallam County and the primary urban center of the north Olympic Peninsula. The population in 2000 was 18,397, with an average population density of 1,823 persons per mile^2 (1094 persons per km^2) (U.S. Census Bureau 2002). Port Angeles experienced a population increase of 3.7 percent between 1990 and 2000 (City of Port Angeles 2004). The population estimate for 2004 was 18,530, which accounts for 28.5 percent of the population of Clallam County.

Minority and Low-Income Populations

E.O. 12898 (February 16, 1994) formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic; (2) Black (not of Hispanic origin) or African American; (3) American Indian or Alaska Native; (4) Asian, Native Hawaiian, or Other Pacific Islander. In 2000, the breakdown according to race for Port Angeles was 16,806 white (91.4 percent), 600 Native American (3.2 percent), 430 Hispanic (2.3 percent), 238 Asian (1.3 percent), 127 black (0.6 percent), and 102 other races (0.5 percent) (U.S. Census Bureau 2002). According to the City Planning Department, no distinct concentrations of minorities exist in the project area or in the City as a whole (Johns 2006).

The Lower Elwha Klallam Tribe lives in the Lower Elwha River Valley and nearby bluffs on the north coast of the Olympic Peninsula, west of Port Angeles. Elwha tribal members participate in commercial fishing, especially salmon fishing, in the area. The project also crosses the Suquamish Tribe's Usual and Accustomed fishing areas.

Persons considered low-income fall below the poverty line threshold. The CEQ guidance proposed that a low-income population exists where the percentage of low-income persons in any geographic unit is more than 20 percentage points higher than in the reference geographic unit. A low-income population also exists in any geographic unit where the number of low-income persons exceeds 50 percent of the total population. The terrestrial cable corridor passes by both lower and upper-middle class housing.

3.8.1.2 Housing

According to the U.S. Census Bureau, there were 8,729 housing units in Port Angeles in 2000 (U.S. Census Bureau, 2000). In that year, 3,337 (38.2 percent) of the total housing units were renter-occupied and 4,750 (54.4 percent) were owner-occupied. Most units (6,365, or 72.9 percent, in 2000) are single-family detached houses. Between 1990 and 2001, 1,142 housing units were built in the city. The median value of a house in the Port Angeles area in 2000 was $111,300.

According to the 2000 U.S. Census, the City of Port Angeles has about 629 vacant dwelling units. In addition, there are at least 496 hotel rooms within 1.4 miles of the center of Port Angeles, 32 cabins within 40 miles, and 363 campsites and RV campsites within 22 miles (Port Angeles Chamber of Commerce, 2005; WorldWeb.com, 2005; US-Parks.com Inc., 2005).

3.8.1.3 Services

Schools

The Port Angeles School District serves an area of about 330 miles^2 (530 km^2) and a population of about 25,000. Total enrollment is about 4,500 students (City of Port Angeles 2005b). Public schools in Port Angeles include six elementary schools, two middle schools, one kindergarten through 11th grade alternative school, three high schools, and one 8th through 12th grade juvenile detention school (NCES 2005). Also within the City of Port Angeles is the Peninsula College, one of 35 community and technical colleges in Washington.

Police and Fire Departments

The Port Angeles Police Department currently employs about 54 personnel, which includes 29 sworn officers. The service area for the department is within the city limits of Port Angeles but the department also provides emergency dispatch for eastern Clallam County. The headquarters is in the City Hall building.

The Port Angeles Fire Department currently employs 23 full-time personnel, which includes 15 firefighters. All the firefighters are also emergency medical technicians and six also maintain paramedic certification. The department provides service within the city limits of Port Angeles. The headquarters is at Fifth and Laurel Streets.

Medical and Emergency Services

The Olympic Medical Center includes the 126-bed Olympic Memorial Hospital, which provides state-of-the-art diagnostic and surgical equipment, sophisticated facilities, and a team of nearly 1,000 health care professionals. The Center also owns and operates a broad range of ancillary services throughout Port Angeles and Sequim.

3.8.1.4 Economic Conditions

The City of Port Angeles is in an area known for its rich natural resources, and the industries they support, especially timber and fishing. Recent declines in these industries have had a major effect on the economy of Port Angeles and vicinity. The closure in 1997 of the Rayonier pulp mill left 200 people unemployed. In recent years, though, there has been an increase in service industries related to tourism in the area and an increase in popularity of the Olympic Peninsula as a retirement destination. Tourism is expanding rapidly with major attractions being sport fishing, Olympic National Park, and the two ferry terminals that provide access to Vancouver Island. Manufacturing has also become an additional source of employment in the city and surrounding area. Westport Shipyard, which employs about 200 people, recently opened a yacht-building facility in Port Angeles (City of Port Angeles 2004).

The median household income in the City of Port Angeles in 2000 was $33,130 (U.S. Census Bureau 2002). Most residential properties within the proposed project area are upper-middle-class single-family residences along Liberty Street between 1st Street and in the vicinity of the proposed converter station site. The residential segment of Liberty Street between Front Street and the shoreline consists primarily of lower-middle-class single-family residences.

3.8.1.5 Harbor Operations

The Port Angeles Harbor is managed by the Port of Port Angeles. The Port has four deepwater terminals with berthing facilities that can accommodate up to five vessels of up to 1,200 feet (366 m) long. The depth at the berths can accommodate vessels with a draft of up to 35 feet (10.7 m) (Port of Port Angeles 2005). The Port also provides for anchorages of up to five ships at any one time; of these, only three can be petroleum ships. A ship seeking anchorage in the Harbor is required to pick up a pilot at the west side of Ediz Hook to maneuver the vessel to the appropriate location. About 70 percent of the ships anchoring in the Harbor are transporting petroleum, and most of those are waiting for their turn to approach the oil refinery in Anacortes (Alger 2005).

Although the Port provides other services, it is best known for its services associated with the timber industry. The Port is a full-service facility for all timber products including logs, lumber, pulp, paper, and wood chips. The log area of the Port handles an average of 60.5 million board feet (141,584 m^3) of logs per year, and services timber mills from as far away as California. Other services provided at the Port are pilot services; topside repair and overhaul services; outfitting services; fuel, lube, and bunkering; provisioning; U.S. Customs and Immigration; cranes; and environmental services (Port of Port Angeles 2005).

Historically, Port Angeles was the home port of a substantial commercial fishing industry with about 200 vessels moored in the Harbor. Abundant returns of salmon migrating through the Strait to natal watersheds in Puget Sound, Hood Canal, British Columbia, and tributaries near Port Angeles were harvested by the Port Angeles fishing fleet. Healthy stocks of ground fish including rockfish, halibut, cod, lingcod, and pollock supported a trawl fishery, and a strong market for Dungeness crab has contributed to the local economy.

The decline of salmon and ground fish populations, changes in fishery management policies, and federal listing of Puget Sound Chinook salmon has had an impact on commercial landings (i.e., the delivery of harvested fish to a processing facility). Figure 3-8 illustrates the decline of salmon landings from 1980 through 2004. In 1993 the salmon fishery was closed to non-treaty fishers and only treaty tribal members are allowed to fish for salmon. Landings from the Washington State Fish Management Area 6, which includes Port Angeles, have remained low since 1992. Ground fish landed at Port Angeles have also shown a decreasing tend since 1980, with the exception of 2004.

The decline of major fish stocks led to a decline in the number of fishers; during the winter of 2004-2005 the Port reported that only 37 commercial fishing vessels were moored in its harbor. These remaining fishers harvest a variety of seafood including crab, shrimp, geoduck clams, sea cucumbers, and sea urchins. Landings of Dungeness crab have substantially increased since 1995, with a market value of about $650,000 in 2004 (see Figure 3-9).

The value of shrimp, geoduck clams, sea cucumbers, and sea urchins harvested in the Strait varies greatly from year to year due to the market and catch. Table 3-12 lists the landings for the year 2004 and the estimated value for these seafood items harvested in the Strait.

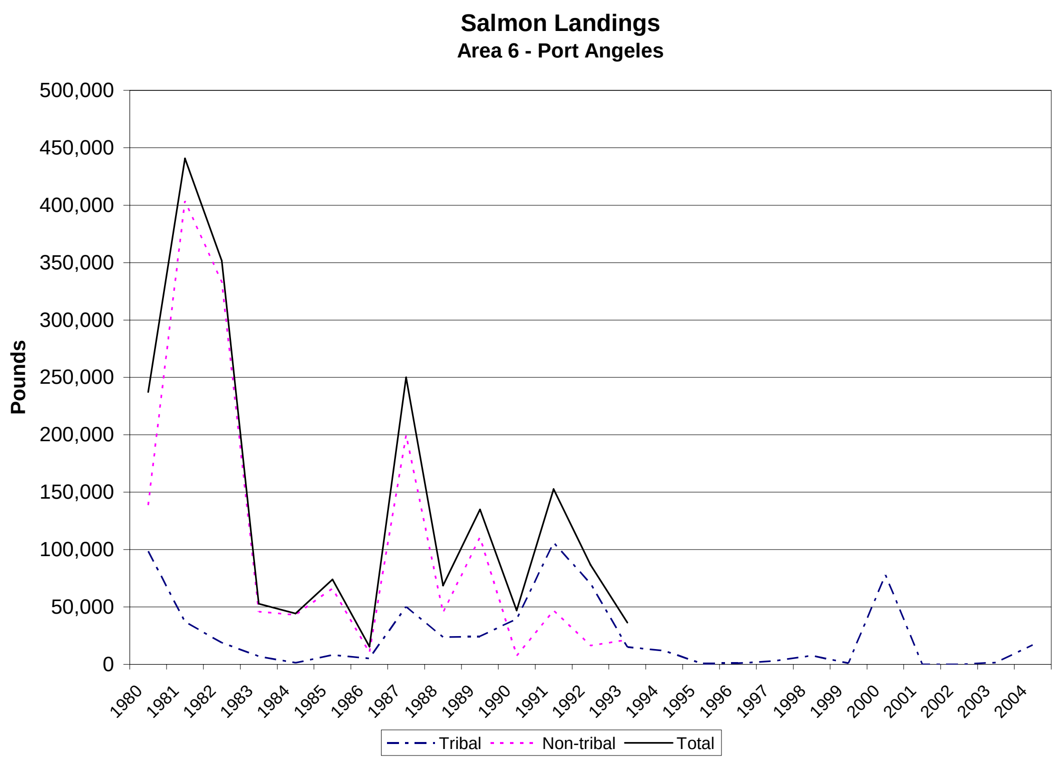


Figure 3-8 Commercial Salmon Landings Near Port Angeles Fish Management Area 6 (WDFW 2005)

Table 3-12 Harvest of Other Seafood Near Port Angeles in 2004

Fishery	Pounds	Estimated Value
Geoduck clams	284,219	$ 739,638
Shrimp	11,665	$ 77,485
Sea cucumber	22,534	$ 35,309
Sea urchin	138,890	$ 109,412
Source: WDFW 2005.		

The Port Angeles Harbor is an important sport fisheries area. Ediz Hook sport fisheries have included salmon, ling cod, Pacific halibut, rockfish, and greenling (City of Port Angeles 1989).

Recreational harvest of salmon and shellfish also is a minor contribution to the local economy. Shellfish harvesting has increased with the decrease in fish harvests. See Figure 3-9 for information regarding commercial shellfish harvest. The recreational harvest of crab is equivalent to about 25 percent of the commercial harvest, with an average of about 83,000 pounds (38 metric tons) each year. Records of recreational salmon and clam harvests were not available.

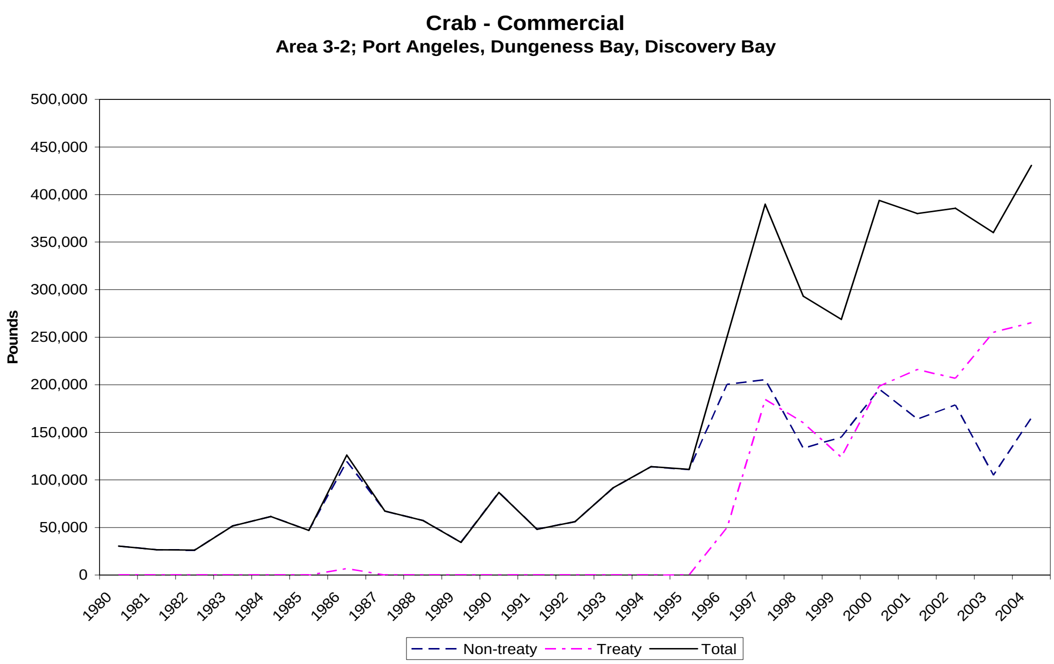


Figure 3-9 Commercial Crab Landings Near Port Angeles Shellfish Management Area 3-2 for 1980 Through 2004 (WDFW 2005)

3.8.2 Environmental Impacts – Proposed Action

Impacts to socioeconomics in the area created by the project could include short-term increases in population and housing needs, increased spending in the area, and potential disruption to harbor operations, fishing, or shellfish harvest.

3.8.2.1 Population, Temporary Housing, and Services

Specialized construction workers would come from outside the area to construct various portions of the project, contributing to short-term population increases in the City of Port Angeles. The 40-person crew of a marine DC cable-laying vessel would be housed on the ship and would not contribute to a short-term population increase. About 85 construction workers would come in from outside the area to work on various portions of the project. Because portions of the project likely would be constructed at different stages, it is expected that not all 85 workers would be present at the same time, but be spread over a year or so. With an estimated 18,530 people in Port Angeles, 85 additional people would be a 0.5 percent increase and not represent a significant deviation from population fluctuations due to tourism and other factors. Impacts to population from construction workers temporarily living in Port Angeles would be ***low***.

Most construction workers would likely stay in trailers at campgrounds or RV parks, others may stay in hotels, and a slim percentage may rent furnished apartments. The construction schedule has yet to be determined. During the winter, Port Angeles has high hotel and campsite vacancy rates. During summer months, tourists occupy many of the temporary housing units and there could be a shortage of temporary lodging. With almost 500 hotel rooms, about 400 campsite, RV sites, or cabins, and about 600 vacant dwellings, lodging needed to accommodate workers would not have a noticeable effect on the local community. Impacts to housing from construction workers living in Port Angeles would be ***low***.

Schools are not expected to be impacted. In general, because the length of stay for any given worker is relatively short, workers coming from outside the project area do not tend to bring their families with them. Therefore, there would be ***no*** additional children enrolled in local schools.

Port Angeles has police, fire, and emergency medical facilities that would be able to handle incidents that could arise during project construction. These services would not be impacted by the additional temporary population or the project construction activities, and operation of the proposed project would not be expected to increase the need or police, fire, or emergency medical services.

The converter station and cable would be operated remotely, so no new workers would be moved to the area. However, the station would require a full-time security guard, who may be hired from the local population. The Port Angeles Substation is staffed and no additional staff would be required for the interconnection. ***No*** long-term change in population or the available housing stock would occur as a result of the project.

3.8.2.2 Economics

Economics in the project area could be impacted by local workers being hired for the project, non-local construction workers buying goods and services, materials for construction being bought locally, and potential harbor or fishing operations being disrupted.

Construction Worker Spending and Materials

Construction workers either brought in for project work or hired from the area would add money to the local economy during construction. Non-local construction workers typically spend about 40 percent of their pay locally (Mountain West Research, Inc., 1981) for lodging, food, and other goods and services. Although the cable-laying ship crew would sleep and eat meals on the vessel, they may occasionally travel to shore for entertainment or supplies (Day 2006). Hiring some local workers for non-specialty jobs, such as traffic control, would also bring money into the local economy.

Although most construction materials would need to be purchased from specialized manufacturers, some minor construction materials, such as gravel and paving materials, may be purchased locally, and would add to the local economy (Day 2006).

Overall, spending, hiring, and purchasing of materials locally would add a relatively small amount to the economy during construction. There would be ***positive low-level*** impacts to the economy.

Long-term impacts to the economy would be minimal. The permanent jobs created by the completed project would only include a full-time security guard for the converter station and a local company hired for grounds maintenance.

Harbor Operations

Impacts to harbor operations at the Port of Port Angeles would be short-term during construction. During two to three weeks of cable-laying work within U.S. waters, ferries, barges, and commercial and recreational ships would need to maneuver around the ship. Since the marine DC cable-laying vessel would move slowly and outside of the ferry route, these ships would be able to easily avoid the construction vessel. Therefore, the ship would cause ***no-to-low*** impacts.

There is a minimal risk that, once in place, the cable could be snagged or hit by ship anchors. According to Puget Sound Pilots, the company responsible for maneuvering large ships into the Harbor, ships would not normally drop anchor in the area where the cable would be located. The only likely time that an anchor could come in contact with the cable would be if a ship drags its anchor to control movement during rough weather. The cable could be buried up to 12-feet (4-m) deep in the Harbor to lessen the potential for anchors reaching the cable within the sediment; in addition, the cable would be shown on nautical charts used for navigation. In the unlikely event that a ship were to snag the cable, the ship operation could be impaired until it could break free. If the cable were severed, the electricity would instantaneously turn-off. There would be ***no-to-low*** impacts. (Please see Section 3.11, for additional information on potential impacts of anchors striking the cable.)

Commercial and Recreational Fishing

There would be ***low*** impacts to fish during cable construction because they are highly mobile and could move out of the area of disturbance (see Section 3.3, Marine Habitat and Wildlife). Fish could potentially sustain moderate impacts from construction noise for the 2-to-3 week 24-hour/day cable laying period, but they would most likely avoid the area during this short period. Fish also could be attracted to artificial lights used at night, throwing-off migration or typical behaviors. If cable construction occurred during fishing season, fishing boats would need to avoid the cable operations. Overall impacts to fish would not be expected to impact fisheries yields or disrupt fishing. There would be ***no-to-low short-term*** construction impacts to the fishing industry and ***no long-term*** impacts.

Impacts to benthic species would be ***low-to-moderate*** (Section 3.3, Marine Habitat and Wildlife). Benthic non-mobile marine species within the pathway of the trenching equipment would be killed and benthic habitat along the cable route would change due to increases in sediment temperature. Some species, such as geoduck, would be unable to regenerate within 2 to 4 yards (2 to 4 m) of the buried cable. The area of benthic habitat within areas of shellfish is relatively small, 1 acre (0.4 ha). The estimated density of geoducks within the Harbor is considered low at 0.024 clams/foot^2 (0.26 clams/m^2), (average density of geoduck clams and mud and sand habitat in Puget Sound is 0.16 clams/foot^2 (1.7 clams/m^2). Because the Harbor is not available for commercial harvest of fish or shellfish because of pollution, harvestable geoducks or sea urchins would not be impacted. Though this population is not harvestable, the clams and urchins could be a seed population and contribute, to a degree, to the reproduction of harvestable geoduck populations outside of the Port Angeles Harbor.

Overall, because the number of shellfish impacted would be low compared to populations in the area, and because the population that would be impacted is not harvestable, there would be ***no-to-low*** impacts to commercial or recreational shell fish harvest.

Minority and Low-Income Populations

Environmental justice addresses whether the proposed project would disproportionately impact disadvantaged populations such as low-income and minority residents.

Less than 10 percent of the population is minority in the terrestrial cable corridor and it passes by both lower and upper middle class residents. In addition, the site of the proposed converter substation is not in an area of distinct racial or socio-economic concentration. Therefore, there would be ***no*** disproportional impact from the terrestrial part of the project.

Since the project would have no-to-low impacts to fishing or shellfish harvest impacts there would be ***no*** disproportional impact to tribal fishing or shellfish harvest.

3.8.3 Mitigation Measures

- Record the location of the marine cable bundle on navigational charts. (Mitigation measure also listed in Health and Safety Section.)

- Bury the cable bundle deep enough to provide protection, up to 12 feet (3.6 m), in areas of soft soils and potential ship anchorage. (Mitigation measure also listed in Health and Safety Section.)

3.8.4 Unavoidable Impacts Remaining After Mitigation Measures

Impacts to socioeconomics with mitigation measures in place would include some low positive impacts to the economy due to construction worker and project supply spending.

3.8.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create ***no*** impacts to socioeconomics.

3.9 Cultural Resources

3.9.1 Affected Environment

This section describes the landscape setting and existing cultural resources in the vicinity of the proposed project. Please see Chapter 4 - Consultation, Review, and Permit Requirements, for a list of the various laws and regulations applicable to cultural resources.

3.9.1.1 Setting

The study area is in the far northwest corner of Washington on the north flanks of the Olympic Peninsula west of Puget Sound. The peninsula is bounded on the west by the Pacific Ocean, to the north by the Strait, and on the east by Puget Sound. Northwestern Washington has been subjected to tectonic movements and multiple continental glaciations, which influenced the topography in the area (see Section 3.5, Geology and Soils).

Prehistory

A few dated archaeological sites and surface finds attest to the presence of people in coastal western Washington and southern British Columbia by at least 11,000 years ago (Carlson 1990; Matson and Coupland 1995). People living in North America during this time are referred to as Paleo-Indian and their presence is marked by a highly distinctive projectile point style known as Clovis. The makers of Clovis points are believed to have been mobile hunters whose economy was primarily focused on hunting megafauna species (such as the mammoth) that became extinct soon after the end of the last glaciation.

Following Clovis is the period spanning from about 8000 Before Present (B.P.) to about 5000 B.P., generally referred to as the Early period. In western Washington, the regional manifestation of these early post-Clovis Holocene economies has been termed Olcott, after the type sites in Snohomish County on the Stillaguamish River (Kidd 1964). Olcott sites are often found in elevated areas at some distance from tidal areas, and on the Olympic Peninsula, Olcott sites have been identified around Lake Cushman and on glacial terraces and alluvial fans above Hood Canal (Wessen and Welch 1991) and the Strait.

The mid-Holocene archaeological record, from about 5000 B.P. to 2500 B.P., shows increasing population and greater socioeconomic complexity (Ames and Maschener 1999). People were using a wider range of marine resources, including sea mammals, fish, and shellfish, and site location analysis shows increasingly specialized use of local environments.

The archaeological trends such as full-scale development of marine-oriented cultures on the Pacific coast, the presence of a mixed marine and terrestrial economy along the shores of Puget Sound, and development of an inland terrestrial mammal and riverine fishing tradition continued through the Late prehistoric period, from about 2500 B.P. and persisting until widespread Euroamerican contact in the early 19th century (Ames and Maschener 1999). The period saw increased community-level aggregation in permanent or semi-permanent winter villages at river confluences and along tidewater shorelines. At the same time, seasonal use of specialized upland and lowland camps focused on the harvesting of targeted resources, such as salmon or camas, also increased. The archaeological evidence for these developing patterns is seen in the greater diversity of hunting, fishing, plant processing, and woodworking tools found in Late period sites.

Ethnography and Ethnohistory

The Klallam people traditionally lived along the southern shore of the Strait from the Hoko River east to Port Discovery and across the Strait on the southern shore of Vancouver Island. The Klallam are Salishan speakers and are thus linguistically related to tribes throughout the Puget Sound basin (Suttles 1990). Like their neighbors, the Klallam followed the abundance of foods through the seasons, but the primary economic activity was oriented around salmon fishing. Seasonal camps were set up to dig clams or to gather berries and other resources. Sea mammal hunting was a limited activity, but occasionally a whale, blackfish, porpoise, or seal would be killed, and beached whales were also used. Land mammals were of minor importance though they were hunted for hides, bone, and antler. Klallam villages were located in sheltered bays or at the mouths of rivers where there was a protected beach suitable for canoes and village activities. A typical village had about 10 houses in a row lining the beach above the highest tides. Temporary, seasonal housing typically consisted of rush mats placed over a framework of poles (Gunther 1927).

The Klallam, with the Skokomish, were signatories to the Treaty of Point No Point in 1855. According to the terms of the treaty, the Klallam retained their hunting and fishing rights, but were to move to a reservation at the mouth of the Skokomish River on Hood Canal. The Klallam were unwilling, however, to move to the Skokomish Reservation, and as a result Klallam families continued to live on Port Angeles Harbor as late as 1933; in 1937 the Lower Elwha Reservation was set aside at the mouth of the Elwha River for 14 families (Ruby and Brown 1986).

History

Port Angeles was initially named “Puerto de Nuestra Señora de Los Angelos” by a Spanish naval lieutenant in 1791. Angus Johnson was the first white settler to settle in Port Angeles in 1857 and by the early 1860s Port Angeles was organized as a town. Early commerce was focused on trade in furs, pigs, and potatoes with the Hudson's Bay Company post at Victoria, British Columbia, located 17 miles (27 km) across the Strait (Martin 1983; Welsh 1941).

Port Angeles developed slowly until the end of the nineteenth century, partly due to its remote location, and partially due to the creation of a federal reserve 1 mile (1.6 km) wide and 5.5 miles (8.9 km) long beginning at Ediz Hook and extending east to encompass the northern portion of the project area. The reserve's location effectively separated the mouth of Ennis Creek from the western portion of the Port Angeles Harbor so that by the 1880s the economic development of the town was effectively stymied (Martin 1983; McCallum and Ross 1961).

The Puget Sound Cooperative Colony was founded in 1887 at the mouth of Ennis Creek at the site later occupied by the United States Spruce Company, and yet later by Rayonier, Inc. (Welsh 1941). The Colony constructed a shingle mill at the mouth of the creek, as well as dwellings, a hotel, and farms. The mill closed down early in the 1890s and the Colony was abandoned by 1904 (McCallum and Ross 1961).

Logging was an early important economic activity of Port Angeles from its beginning, but the industry began to expand considerably after the federal reserve was opened to homesteading in the 1890s. Logging and the wood products industry continued to play an increasingly vital role in the city's economy after World War I with construction of the Crescent Boxboard Company paperboard mill west of the city in 1918.

In 1930 the Olympic Forests Products Company, later Rayonier, Inc., went into production at the mouth of Ennis Creek. The company initially built a pier, placed riprap along the shoreline, diverted Ennis Creek to the east, and constructed several buildings. The facility went through several phases of expansion, and by 1961 Rayonier was the world's largest manufacturer of chemical cellulose (McCallum and Ross 1961). The mill discontinued operations in March 1997 (Robbins, Forsman, and Larson 1997).

The east portion of the town on the bluff above Ennis Creek did not see much development until well after the end of World War II (Sanborn Fire Insurance maps 1924-1949). Other than the Rayonier, Inc., facilities, most growth was centered west of the project area at the base of Ediz Hook and along the shore behind Hollywood Beach. More recently, suburban development has occurred on the hills south of Highway U.S. 101, and at the intersection of Liberty Street and Front and 1st Streets, which now contains a few light industrial and retail buildings.

3.9.1.2 Marine Archaeology and Historical Resources

Previously Documented Resources

Archival research identified 12 vessels and two aircraft wrecked in the general vicinity of Port Angeles since 1862. One vessel, the *Cadboro*, was a wooden schooner owned by the Hudson's Bay Company that wrecked in 1862. The vessel was based out of Fort Vancouver, and at the time of its demise in the Strait was hauling timber (Barnard 1991). Another vessel, the *W.H. McFadden*, sank in 1947 in the Strait, and several members of the crew went down with the ship.

Field Survey

The marine portion of the proposed cable corridor was surveyed with sonar to help determine the possible presence of cultural resources. The data was used to determine the possible presence of resources on the portion of the corridor in the Harbor. The data for the deep water portions was collected at a coarser resolution, which has been difficult to decipher.

High-resolution sonar data for the area immediately seaward of the HDD hole end point were examined out to a water depth of about 167 feet (50 m). Examination of this data did not reveal any submerged terrestrial landforms such as beach berms or streambeds in the vicinity of the Harbor. Four sonar anomalies (an irregular form on the sea bed) in the vicinity of the HDD hole end point (about 295 to 377 feet [90 to 115 m] from the cable center-line) were located that were suggestive of the presence of marine archaeological and historical materials.

Due to the coarser nature of the sonar data for the remainder of the cable route (north of Port Angeles Harbor to the international boundary), it is unknown at this point if potentially significant marine archaeological resources are present north of Port Angeles Harbor.

3.9.1.3 Upland Archaeology and Historical Resources

Previously Documented Resources

A precontact and ethnohistoric Klallam village is at the mouth of Ennis Creek below the Water Street bluff. The Klallam village had an associated burial ground now under 10 feet (3 m) of fill below the former Rayonier, Inc. parking lot. The mouth of Ennis Creek is also the site of the Puget Cooperative Colony. The Colony buildings were on both sides of Ennis Creek and extended to the base of the Water Street bluff.

During archaeological studies carried out in association with dismantling the Rayonier plant, a small concentration of marine shell fragments was found on a low alluvial terrace along the right bank of Ennis Creek (Robbins, Forsman, and Larson 1997).

Beyond the confines of this project, a number of precontact archaeological sites dating to the early and mid-Holocene have been found along the northern margins of the Olympic Peninsula. The Manis Mastodon site near Sequim, was a hearth feature with an associated Olcott projectile point resting on tephra from the climactic eruption of Mt. Mazama in Oregon (6850 B.P.) (Morgan 1999). Two other archaeological sites, also near Sequim contained Olcott-type occupations (Morgan 1999). Although no reliable radiocarbon ages were obtained, the artifacts share styles and assemblage attributes in common with early Holocene assemblages from other dated sites in the region. Closer to the project, the Van Os (or Vanos) site in Port Angeles may have been a major late Olcott campsite.

An important archaeological site dating to the late Holocene is Tongue Point on the coast west of Port Angeles. This site produced radiocarbon ages of 220, 2600, and 2700 B.P. (Bergland 1983).

Most of the few precontact sites known along the Strait are now on bluffs or old marine terraces well above the present high tide limit. Generally, these sites contain the same kinds of material found associated with later shell middens on the northern Washington coast: shell, sea mammal bones, charcoal, wood ash lenses, fire-modified rock, and a few artifacts, mostly small bone points or bone woodworking wedges.

Field Survey

Previous archaeological investigations along the shoreline of the Strait, and in the Puget Sound basin in general, indicate that level areas and topographic highs are high-probability areas for harboring precontact archaeological materials. In the project area, the areas of little to no slope appear most likely to contain archaeological materials spanning most of the last 10,000 years. Historical documents indicate that historical archaeological resources, though the probability of their occurrence is considered low to moderate, are likely to be found anywhere within the proposed project boundaries.

Pedestrian and driven surveys were conducted along the paved areas of the project (the HDD construction site and the DC and AC terrestrial cable routes). Because the areas are paved, it could not be determined if cultural resources are present. Given the amount of surface disturbance, however, it seems unlikely that wide-ranging intact precontact archaeological materials would be preserved, but, because of the presumed age of the landform, early Holocene archaeological materials relating to the Clovis and Olcott periods may be present.

A pedestrian survey was also conducted on the converter station site and because of extensive surface disturbance, no shovel probes were done.

A pedestrian survey and shovel probes were completed on the BPA Port Angeles Substation property where construction would occur for the interconnection. The probes were 12 inches (30 cm) in diameter and spaced about 130 feet (40 m) apart along the edge of a wooded zone at the west edge of the parcel. No evidence of cultural resources was found.

3.9.2 Environmental Impacts – Proposed Action

The Proposed Action includes ground-disturbing activities that have the potential to cause direct impacts to cultural resources within the project area. If resources were present, such ground disturbance could destroy the relationships among artifacts and features and their contexts, or could cause the destruction of historic structures or buildings.

3.9.2.1 Marine DC Cable

No known marine archaeological or historical resources exist within the marine cable corridor. For the portion of the cable corridor that would be near the HDD hole end point, the four anomalies that could potentially be undiscovered resources are far enough from construction activities and would not be impacted. For the remaining portion of the cable route, due to the coarser resolution of data for this area, it is not known whether any potentially significant undiscovered marine archaeological and historical resources may exist. If trenching occurs across any undiscovered resources, then impacts could be ***moderate-to-high***. With mitigation identified in Section 3.9.3, these impacts could be avoided so there would be ***no*** impacts.

If shipwrecks are found and the public becomes aware of the shipwreck location(s), recreational diving of the area may increase. As a result, potentially significant marine archaeological and historical resources may experience damage or destruction. If this occurs, impacts could be ***low-to-moderate***.

3.9.2.2 Horizontal Directional Drill Hole

The sonar anomalies found near the HDD hole end point in the Harbor are far enough from project activities and would be avoided. There would be ***no*** impacts to marine archeological resources if identified sites are avoided.

The HDD hole route would pass under the precontact and ethnohistoric Klallam Village and associated burial ground and the site of the Puget Cooperative Colony. The depth of the bore is expected to be about 130 feet (40 m) below mean sea level and in the Miocene-aged Pysht Formation. As designed, the bore angle and depth would be below the maximum depth of precontact and historical burials, precontact structures, and historic building and structure foundations; there would be ***no*** impact to cultural resources.

3.9.2.3 Terrestrial DC Cable

No known significant archaeological or historical resources have been documented along the cable trenching route, and modern land use (grading and street paving) indicates the probability of encountering significant resources during construction is low. Regardless, the landscape setting and the proximity of culturally-sensitive archaeological materials indicate isolated archaeological materials of considerable antiquity or cultural importance may be present. If trenching occurs across any undiscovered resources, then impacts could be ***moderate-to-high***. With archeological monitors present during construction in level areas (which are more likely to contain resources), impacts would be ***low.***

3.9.2.4 Converter Station

There was no evidence of cultural resources present on the converter station site. Because the site has been disturbed by construction of existing transmission lines and access roads and by tree clearing, it is not expected that undiscovered resources would be found; there would be ***no*** impacts.

3.9.2.5 Terrestrial AC Cable

There are no known cultural resources along the AC cable route. Though the route could not be surveyed to determine evidence of unknown sites, it is assumed that modern land use (grading and street paving) has lessened the probability of encountering significant resources during construction. With the landscape setting and the proximity of culturally-sensitive archaeological materials, cultural sites could be present. With archeological monitors present during construction in level areas (which are more likely to contain resources) impacts would be ***low***.

3.9.2.6 Port Angeles Substation Interconnection

Since no known cultural sites are on the property and since there was no evidence of cultural resources on the portion of the Port Angeles Substation where the interconnection construction activities would take place, it is expected that no unknown resources would be present and there would be ***no*** impacts.

3.9.3 Mitigation Measures

- Identify and locate any potential historic resources along marine cable corridor using existing sonar data, if adequate, or gather additional data, if necessary.
- Determine final cable alignment to avoid potentially significant resources.
- Develop an Inadvertent Discovery Plan that details crew member responsibilities for reporting in the event of a discovery during marine cable installation.
- Ensure tribal monitors from the Lower Elwha Klallam Tribe are present during excavation at the HDD platform, trenching along level areas of the terrestrial route, and excavation at the converter station site and interconnection site work.
- Develop an Inadvertent Discovery Plan that details construction worker responsibilities for reporting in the event of a discovery during terrestrial excavation.
- If final placement of the project elements results in unavoidable adverse impacts to a significant resource, prepare a Mitigation Plan to retrieve the scientific and historical information that makes the site significant under the direction of a qualified archeologist and in consultation with Washington SHPO and the Lower Elwha Klallam Tribe.
- Stop work immediately and notify local law enforcement officials, the Washington SHPO, and the Lower Elwha Klallam Tribe if project activities expose human remains, either in the form of burials or isolated bones or teeth, or other mortuary items.

3.9.4 Unavoidable Impacts Remaining After Mitigation Measures

With mitigation measures in place to identify potential cultural sites along the marine bed prior to construction and realign the cable route as necessary, as well as provide monitors in areas of high probability for the presence of unknown sites, and plans to mitigate if sites are found during construction, there would be no unavoidable impacts to cultural resources.

3.9.5 Environmental Impacts – No Action Alternative

With the No Action Alternative there would not be any ground disturbing activities or changes to potentially historic sites, therefore there would be ***no*** impacts to cultural resources.

3.10 Noise

3.10.1 Affected Environment

3.10.1.1 Noise

Noise is regulated in the City of Port Angeles by Municipal Code, Chapter 15.16. In addition, the City has adopted by reference Chapter 173-60 of the Washington Administrative Code (WAC) – Maximum Environmental Noise Levels. Clallam County's regulation of noise is solely based on WAC 173-60.

Environmental noise is usually measured in decibels on the A-weighted scale (dBA). This scale models sound as it corresponds to human perception. In general, each 10 dBA increase equates to a doubling of perceived noise. The applicable environmental designations for noise abatement (EDNA) standards for both the City and the County are shown in Table 3-13 below. These apply during daylight hours; all categories are reduced by 10 decibels dBA for nighttime. Most of the project vicinity is residential and the Class A standards apply. (See Section 3.3.2.2 for discussion regarding underwater noise).

Table 3-13 State Noise Maximum Limits

EDNA of Noise Source	EDNA of Receiving Property		
	Class A Residential/Recreational	**Class B Commercial/Business**	**Class C Industrial**
Class A	55 dBA	57 dBA	60 dBA
Class B	57 dBA	60 dBA	65 dBA
Class C	60 dBA	65 dBA	70 dBA

Key: dBA = Decibel (A-weighted).

A-weighted decibels are an adjusted measurement of the relative loudness of sounds in air as perceived by the human ear. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with unweighted decibels, in which no correction is made for audio frequency. This correction is made because the human ear is less sensitive at low audio frequencies, especially below 1,000 Hz, than at high audio frequencies (Scientific Interdisciplinary Ecology and Noise Committee 1998). A-weighted decibels are an adjusted measurement of the relative loudness of sounds in air as perceived by the human ear. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with unweighted decibels, in which no correction is made for audio frequency. This correction is made because the human ear is less sensitive at low audio frequencies, especially below 1,000 Hz, than at high audio frequencies (Scientific Interdisciplinary Ecology and Noise Committee 1998).

Construction noise is exempt from City of Port Angeles noise regulations between the hours of 7:00 a.m. and 10:00 p.m. Table 3-14 shows typical noise levels for common sources expressed in dBA.

Table 3-14 Common Noise Levels

Noise Source or Effect	Sound Level, dBA*
Rock-and-roll band	110
Truck at 50 feet	80
Gas lawnmower at 100 feet	70
Normal conversation indoors	60
Moderate rainfall on foliage	50
Refrigerator	40
Bedroom at night	25

* Decibels (A-weighted)
Sources: Adapted from Bonneville 1986, 1996.

Table 3-15 Typical Construction Noise Levels

Type of Equipment	Maximum Level (dBA) at 50 Feet
Road Grader	85
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82
Crane	85
Heavy Trucks	88
Combined Equipment	89

Source: Thalheimer 1996.

Background noise levels were taken at the HDD hole construction site on Liberty Street and at the converter station site. At the HDD hole construction site, the levels were 60 dBA (City of Port Angeles, July 2006). Noise levels during a site visit were observed to be exclusively from passing automobiles. Noise generated from US 101 (Front Street) located 2 blocks (more than 600 feet [183 m]) south of the HDD hole construction site was undetectable.

Sound measurements taken by the City of Port Angeles at the converter station site and adjacent to Lauridsen Boulevard found that ambient background sound ranged from 51 dBA to 53 dBA during daytime hours. Cars traveling by brought the sound levels up to 65-68 dBA, occasionally as high as 70 dBA. However, sound readings also often dropped below 50 dBA indicating that nighttime sound levels would likely be at or below the 45 dBA noise limits for residential areas.

3.10.2 Environmental Impacts – Proposed Action

3.10.2.1 Marine DC Cable

The trenching and laying of the cable at sea would be a continuous 24 hour/day operation, but there would be minimal noise impact to residents along the shoreline except for the time while the cable installation process is being conducted in Port Angeles Harbor. (See Section 3.3 for noise impacts to marine species and Section 3.4 for noise impacts to terrestrial wildlife). It is anticipated that work within the Harbor would be completed within 2 to 3 days. The sound would be generated by power winches, cable-laying equipment, and other construction equipment, and the ensuing noise would be similar to the levels of large vessels entering the harbor, 160 decibels (dB) at 100 Hz (Potter 2000). Although the noise would also occur at night when ambient noise levels are generally low, the construction noise would be for a short duration (2 to 3 nights), would be similar to existing noise due to Harbor traffic, and impacts would be considered ***low***.

3.10.2.2 Horizontal Directional Drill Hole

To avoid damage to the equipment and potential loss of the integrity of the drilled hole, the drilling operations, once drilling is commenced, cannot be stopped, except in cases of emergency. The HDD drilling operation would generate continuous noise (day and night) for about 23 days.

The stationary equipment at the HDD hole construction site would contain the following equipment: drilling rig, support air compressor, electrical generator, and a mud makeup/recovery system. Each of these components would have an engine. Stationary equipment produces a relatively constant noise level at a given location over the work period. Noise generated from the HDD operation would be 90 to 95 dBA, slightly louder than typical construction noise levels.

Noise levels would decrease over distance. At a distance of 600 feet (183 m), the noise level would be reduced to 45 dBA, within the allowable limits for 24 hour sound levels. Residents within a one-block radius would hear the HDD construction noise, with louder noise impacts to those closest to the source. The Olympic Medical Center is located about 1,500 feet from the HDD hole construction site and would not be impacted by noise from the construction activities.

If geological conditions are very favorable, it may be possible to suspend some drilling operations during hours outside of the specified hours. Some of the equipment can likely be scheduled so that it is not needed during drill operation. For example, trucks for removing cuttings from the mud tank could be scheduled for either early evening or early morning to reduce the noise level during the night.

By state and local regulations, construction noise is exempt from the rules between the hours of 7:00 a.m. and 10:00 p.m., but, since the operation would be 24 hours per day, construction noise would not meet local or state noise regulations. Sea Breeze has received a City-approved variance from the noise ordinance to allow for continuous operation of the HDD drilling.

Impacts due to noise from the HDD hole construction would be short term and ***high***.

3.10.2.3 Terrestrial DC Cable

Noise from the construction of the terrestrial DC cable would emanate from cutting the road surface (concrete and asphalt), excavating the trench, laying the cable, backfilling the trench, and resurfacing of the road. The time frame for trenching construction would be about one block per five days or less. These construction activities would be conducted between the hours of 7 a.m. and 7 p.m. Noise levels would be 85 to 90 dBA from these activities, but disturbance to residents would occur during daylight hours and residents along the route would be temporarily disturbed as construction progressed linearly past them.

Between E. 5th and E. 8th streets, the blasting that would be required to obtain the appropriate cable trench depth would cause noise disturbance. In general, noise levels for blasting are typically less than 100 dBA, but can be up to 138 dBA maximum. Construction would require two blasts per day for 10 days.

Noise impacts related to the terrestrial DC cable construction would be temporary and ***moderate*** to local residents and business along the cable route.

Since the cable would be DC, there would be no corona discharge and therefore no corona discharge related noise; the operation of the transmission cable would not emit noise.

3.10.2.4 Converter Station

Construction of the converter station between East Lauridsen Boulevard and East Park Avenue would require clearing and grading, truck deliveries of equipment and material, and construction of a large building and assembly of electrical equipment. All of these construction activities would occur between the hours of 7 a.m. and 7 p.m. Noise levels would be typical of construction activities: 85 to 90 dBA. Although the converter station is estimated to be constructed over a 7-month period, the noise levels for heavy construction would only be a portion of this time frame and would vary depending on the phase the construction. Disturbance to residents would occur during daylight hours. Noise impacts due to the construction of the converter station would be ***low***.

The converter station would convert the DC electricity to AC electricity for transfer to the BPA transmission system. The primary source of noise during operation of the facility would likely be the transformers, cooling fans, ventilation openings in the building, and air conditioning equipment. Converter stations typically produce noise levels of 40 to 65 dBA at the perimeter fence, whereas substations typically generate noise levels between 35 and 55 dBA. Since it is assumed that ambient night-time noise levels near the converter station are 45 dBA or below, the converter station may raise ambient night-time noise in the immediate vicinity. Sea Breeze plans to design the converter station to lessen noise that could emanate from the equipment. There would be ***no-to-low*** impacts due to the operation of the converter station if station design can keep noise levels to night-time ambient levels, but would be ***low-to-moderate*** if night-time ambient noise levels are increased to local residents.

3.10.2.5 Terrestrial AC Cable

Construction noise impacts for the terrestrial AC cable would be similar to the terrestrial DC cable construction (noise from cutting road surface, excavating, cable laying, backfilling, and resurfacing with noise levels of 85 to 90 dBA during the hours of 7 a.m. and 7 p.m.); however construction would occur over a 21 day period and blasting would not be required. Impacts would be ***low***.

3.10.2.6 Port Angeles Substation Interconnection

Construction noise impacts for the interconnection work would be similar to the converter station, but would include more tree clearing and soil movement work. Construction activities would occur over a 6 month period (though noise levels would vary within that time frame depending on the phase of construction), between the hours of 7 a.m. and 7 p.m., with typical construction noise levels of 85 to 90 dBA. Impacts would be ***low***.

Since the interconnection would not include the addition of transformers (the greatest contributor to noise generation in a substation), operational noise levels would not be increased at the Port Angeles Substation; there would be ***no*** impact to noise.

3.10.3 Mitigation Measures

- Incorporate the use of sound attenuating techniques at the HDD construction site to reduce noise levels as close to its source as possible.
- Do not permit the use of equipment with back-up warning devices between the hours of 7:00 p.m. and 7:00 a.m.
- Reduce the speed of the HDD drill during non exempt hours, if possible, to limit noise levels.
- Enclose major noise-generating equipment inside converter station building, where possible.
- Place cooling fans at converter station away from residents.

3.10.4 Unavoidable Impacts Remaining After Mitigation Measures

Construction would generate noise. The HDD hole construction site would generate noise 24 hours per day for 23 consecutive days at levels slightly louder than typical construction noise levels for residents within a block radius; cable trenching would generate construction noise during the daytime, including some blasting over a 10-day period. Operation of the converter station, even with implementation of mitigation, may raise noise levels in the vicinity of the converter station.

3.10.5 Environmental Impacts – No Action Alternative

The No Action Alternative would not generate any noise. There would be ***no*** noise impacts.

3.11 Health and Safety

3.11.1 Affected Environment

3.11.1.1 Electric and Magnetic Fields

Electric transmission facilities move electrical energy from the source of generation to the end user for heating, cooling, lighting, industrial processes, and other purposes. These same facilities, if not constructed and operated properly, can lead to potential harmful effects.

Transmission lines, like all electric devices and equipment, produce electric fields and magnetic fields. Current (the flow of electric charge in a wire) produces the magnetic field. Voltage (the force that drives the current) is the source of the electric field. This combination of electric and magnetic fields is often referred to as "electromagnetic fields" (EMF).

Electrical systems operate via direct current (DC) or alternating current (AC). DC is constant over time, while AC varies, or cycles, over time in both magnitude and polarity. The frequency of these AC cycles is expressed in Hertz (Hz), which is the number of cycles per second (i.e., 1 Hz is equal to one cycle per second). Typically in North America, AC systems operate at 60 Hz. The AC current produces a magnetic field that also fluctuates or varies with time which can induce small currents in surrounding objects. However, since DC is constant over time, the corresponding DC magnetic fields do not induce currents in surrounding stationary objects.

Electrical field strength is measured in kilovolts per meter (kV/m). In a home, the AC electric field strength from wiring and appliances (from 110-volt circuits) is typically less than 0.01 kV/m. EMF levels decrease exponentially from the field source.

There are no federal or Washington state standards governing AC or DC electric fields; however, BPA has established a standard for AC electrical field strength of 9 kV/m maximum on rights-of-way and 5 kV/m at the edge of rights-of-way. BPA has no DC electric field standard.

The strength or intensity of magnetic fields is commonly measured in a unit, called a gauss. A milligauss (mG) is a thousandth of a gauss. The earth's natural DC magnetic field of about 500 mG points northward in the Pacific Northwest. In the Port Angeles area, the magnetic field is about 550 mG. DC transmission lines produce a static magnetic field, like the magnetic field of the earth. DC magnetic fields are different than AC magnetic fields, because DC does not cycle and therefore does not induce currents in surrounding stationary objects, including people. The international guideline for continuous public exposure to DC magnetic fields is 400,000 mG (International Commission on Non-ionizing Radiation Protection, 1994, World Health Organization, 2006).

The AC magnetic field strength in the middle of a typical living room measures about 0.7 mG (California Department of Health Services and the Public Health Institute 2000). Typical magnetic field strengths for some common electrical appliances found in the home are given in Table 3-16. There are no national guidelines or standards for magnetic fields.

Table 3-16 Typical Magnetic Field Strengths (1 foot [0.3 m] from common appliances)

Appliance	Magnetic Fields (mG)[1]
Coffee maker	1-1.5
Electric range	4-40
Hair dryer	0.1-70
Television	0.4-20
Vacuum cleaner	20-200
Electric blanket[2]	15-100

mG = milligauss
[1] The magnetic field from appliances usually decreases to less than 1 mG at 3 to 5 feet from appliances.
[2] Values are for distance from blanket in normal use (less than 1 foot away).
Source: Miler 1974; Gauger 1985.

Throughout the land portion of the proposed project there are sources of EMF, including appliances, existing AC transmission and distribution lines, and electrical substations.

3.11.1.2 Toxic and Hazardous Materials

The former Rayonier pulp mill located at 700 North Ennis Street is a contaminated site. The mill property consists of about 80 acres (32 ha), including submerged land in the southeastern portion of Port Angeles Harbor. The pulp mill operated from 1930 to 1997 and used an acid sulfite and bleaching process to produce paper products. Most of the facility has been dismantled since its closure (Integral Consulting and Foster Wheeler 2003). See Section 3.1, Water Resources, for more information regarding the types of contaminants.

3.11.1.3 Anchor and Dredging Depths

The potential for cable damage exists, for example through digging on land, or dropping an anchor in the ocean.

Table 3-17 below shows typical depths that anchors plunge into the ocean floor and dredging occurs. Anchoring along the marine route is predominantly found within the Port Angeles Harbor, to the west and northwest of the cable route. This area has soft to firm soil. Anchors of the largest ships could penetrate up to 9.5 feet (2.9 m) into the ocean floor sediments.

Table 3-17 Typical Depths for Anchors and Dredging

Physical Threat to Cable	Penetration Depth in Feet (Meters)	
	Hard Ground and Rock	Soft to Firm Soils (sand, gravel, some clay)
Trawl boards, beam trawls, scallop dredges	< 1.3 (0.4)	1.6 (0.5)
Hydraulic dredges	< 1.3 (0.4)	2.0 (0.6)
Stow net fishing anchors	N/A	6.6 (2.0)
Ship anchors up to 10,000t DWT (50% of world fleet)	4.9 (1.5)	6.9 (2.1)
Ship anchors up to 100,000t DWT (95% of world fleet)	7.2 (2.2)	9.5 (2.9)

Source: Improvements in Submarine Cable System Protection, 2004, Submarine Cable Improvement Group.
t DWT = Tonnes, deadweight tonnage.

3.11.2 Environmental Impacts – Proposed Action

The proposed project health and safety issues include shocks, increased exposures to magnetic fields, use and disposal of toxic and hazardous materials, and risk of fire.

3.11.2.1 Electric and Magnetic Fields

Possible effects from transmission line electric and magnetic fields interactions with people fall into two categories: immediate shocks or electrocution associated with electric fields, and possible long-term health effects associated with magnetic fields.

Electric Fields

High-voltage electric transmission lines, like electrical wiring, can cause serious electric shocks if precautions are not incorporated into their design and construction. Electrical transmission lines are required to be designed and constructed in accordance with the National Electrical Safety Code (NESC). The operation and maintenance of electrical facilities is also required to meet the requirements of the Occupational Safety and Health Administration found in 29 CFR Part 1926.956.

Unlike magnetic fields, electric fields exposure can be limited by grounding. Objects, such as buildings, or soil can provide a shield and also limit electric fields. Both the DC and AC cables would be in trenches and the AC cables would also be buried in a concrete vault due to their higher electric field strength. Because electric fields from buried cables are shielded by grounding, soil, and water, the remaining net electric field would vary depending on surrounding conditions. The DC electric field in the earth directly above the cable would be about 0.004 kilovolts per meter (kV/m), less than the AC levels found in homes. The AC electric field would be about 0.02 kV/m at ground level directly above the AC cable, which is about the same AC electric field found in a typical home. There would be no increased electric field exposure.

The energized electric cables could potentially be exposed and damaged during third-party construction, which could potentially result in an electrical shock to construction workers. There is no danger in being next to a cable. The risk would occur if backhoes or other excavating or cutting equipment breach the insulation of the cable, in which case an arc could form and melt the insulation of the cable. Workers could be shocked, but the safety risk is minimal as the cable would cease operating in less than 1/30th of a second. Ship anchors could damage the cable, but if the submarine cable insulation was breached by an anchor or by fishing equipment, the electric field would be almost entirely grounded by the water and there would be no danger from the electricity to people on the boat or to the boat itself. With most anchoring occurring near the Port Angeles Harbor, measures will be taken in this area to protect the cable with deeper burial. The potential to come in contact with the buried DC or AC cables is small; ***no*** impacts are expected.

Within the fenced electric yard at the converter station, there would be electrical fields around the transformers and other equipment that would pose a potential for an electrical shock if people come into contact with any bare conductors on transformers or other electrical equipment. However, these fields would be reduced by building materials and grounding mats, and would not be increased outside of the site boundaries. The entire station would be within a secure, fenced area, with only authorized access. ***No*** impacts are expected.

Within the fenced electric yard at the Port Angeles Substation interconnection, there would be electrical fields around the new equipment that would pose a potential for an electrical shock if people were to come into contact with it. The new electric yard would have a grounding mat and would be with within a secure, fenced area with only authorized access. ***No*** impacts are expected.

The existing overhead transmission lines that could be relocated present an existing hazard to those working around them. They have clearances to meet the NESC, and any relocated lines would also meet the NESC. The transmission lines are not in agricultural areas where irrigation pipe could come in contact with the lines. The BPA transmission lines would meet BPA's standard for AC electrical field strength of 9 kV/m maximum on rights-of-way and 5 kV/m at the edge of rights-of-way. ***No*** impacts are expected.

Magnetic Fields

Because DC magnetic fields do not induce currents in surrounding objects, magnetic fields from the proposed DC cable would not induce currents in people. The configuration of the two DC conductors, one positive and one negative, laid side-by-side, would cancel out some of the magnetic fields created by the cables. The static magnetic fields from the DC cables at maximum current carrying capacity would be about 550mG. Depending on the angle between the cable and the naturally-occurring geomagnetic field (of about 550 mG), the DC cable would add to or subtract from the geomagnetic field. The field levels would decrease with distance from the cable.

The DC magnetic fields would not create a health risk because humans are continuously exposed to the Earth's magnetic field, DC fields do not induce currents in objects, and the DC magnetic fields created would be well below international guidelines for continuous public exposure (400,000 mG, International Commission on Non-ionizing Radiation Protection, 1994, World Health Organization, 2006). Impacts from the DC cable would be ***low***.

Animals that depend on magnetism for navigation may be misdirected somewhat while in the combined magnetic field (see Section 3.3.2.2, Marine DC Cable).

Exposure to AC magnetic fields has been the subject of worldwide research because of concerns that increased EMF levels could cause health effects. AC magnetic fields are most in question as possible sources of long-term effects, although studies sometimes lump the two (electric and magnetic) fields together. For the latest information on health studies please see the determination of the National Institute of Environmental Health Science (NIEHS) and to the related web site http://www.niehs.nih.gov/emfrapid/home.htm. Scientific reviews of the research on EMF health effects have found that there is insufficient evidence to conclude that EMF exposures lead to long-term health effects. However, some uncertainties remain for childhood exposures at levels above 4 mG (National Institute of Environmental Health Sciences, 1999).

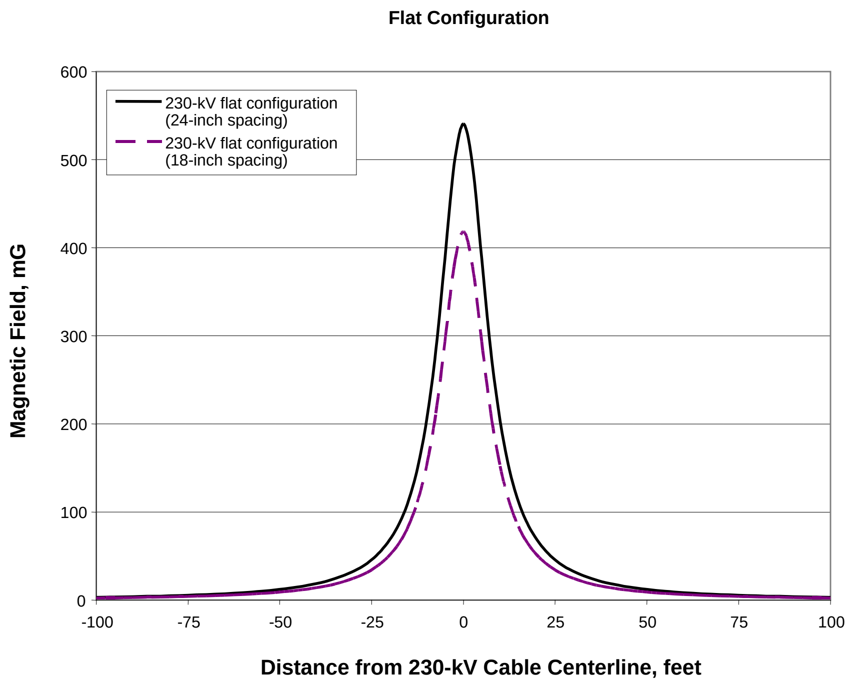
An increase in public exposure to AC magnetic fields could occur if field levels increased or if residences or other structures draw people to areas of magnetic fields. The predicted field levels are only indicators of how the proposed AC transmission cable or overhead lines may affect the magnetic-field environment. They are not measures of risk or impacts on health.

The magnetic field levels for the proposed buried AC cable were calculated. The field levels were calculated at a standard height of about 3.3 feet (1 m) above the ground, with a worst case maximum current level and a 4-foot (1.2-m) burial depth. Two cable configurations were calculated: flat (3 conductors side-by-side) or delta (3 conductors in a triangle shape). The conductors were assumed to be either 18 or 24 inches (0.46 or 0.61 m) apart.

Because magnetic fields tend to cancel out each other, the fields are lower when the conductors are closer together. Field levels also dramatically lessen with distance.

Directly over the AC cable (the centerline) the field levels could be between 541 mG and 193 mG, depending on the configuration and spacing. Figures 3-10 and 3-11 show the expected magnetic fields for the two configurations. About 15 feet (4.5 m) from the centerline the levels drop to between 42 mG and 87 mG. About 30 feet (9 m) from the centerline, the magnetic field levels drop down to between 12 mG and 33 mG, depending on the configuration and spacing. Table 3-18 lists the magnetic fields at the centerline of the cable and at select distances. The closest houses along Porter Street are about 45 to 60 feet (14 to 18 m) from the edge of the road. Nearby residents could have some increased exposure to magnetic fields depending on the cable configuration and placement in the street and the distance from the cable to a residence. For the AC cable routing options onto BPA property, Option A would be routed along Porter Street for about 200 feet (61 m) longer than Option B, though there are no houses along most of this 200-foot (61-m) long stretch. Overall impacts would be ***low-to-moderate***.

Figure 3-10 Computed Magnetic Fields at 3.3 feet (1-m) Above Ground for Proposed AC Terrestrial 230-kV Cable; Flat Configuration



Magnetic fields at the perimeters of electrical stations tend to be greatest where transmission lines enter or exit the station. The field levels in these areas are the same field levels of those lines. Hence, the converter station would have the DC magnetic field levels where the cable enters the station, and the AC magnetic field levels where the line exits the converter station.

Several existing overhead power lines would be reconfigured as part of the Proposed Action (see Section 2.1.4, Converter Station and Section 2.1.6, Port Angeles Substation Interconnection). The existing transmission lines across the converter station site would be rerouted under the converter station, rerouted over the converter station, or moved along the edge of the property boundary. The converter station site is surrounded by streets, except for on the west side. If the lines remain in the same location, whether buried under the converter station or placed on new towers over the station, the magnetic fields would likely remain the same. If the lines are moved or reconfigured, the existing magnetic fields would change. Because Sea Breeze plans to leave a 100-foot (30-m) vegetative buffer on the west side of the property, if the lines are moved to west side of the property the lines would be located at least 100-feet (30 m) from the property boundary. Because field levels reduced rapidly with distance, increased levels would not be expected at the edge of the property. If the lines were moved to the east side of the property, there are no residences on that side and there would be no potential for long-term increase in public exposure. There would be ***no-to-low*** impacts do to rerouting the existing transmission lines on the converter station site.

Figure 3-11 Computed Magnetic Fields at 3.3 feet (1-m) Above Ground for Proposed AC Terrestrial 230-kV Cable; Delta Configuration

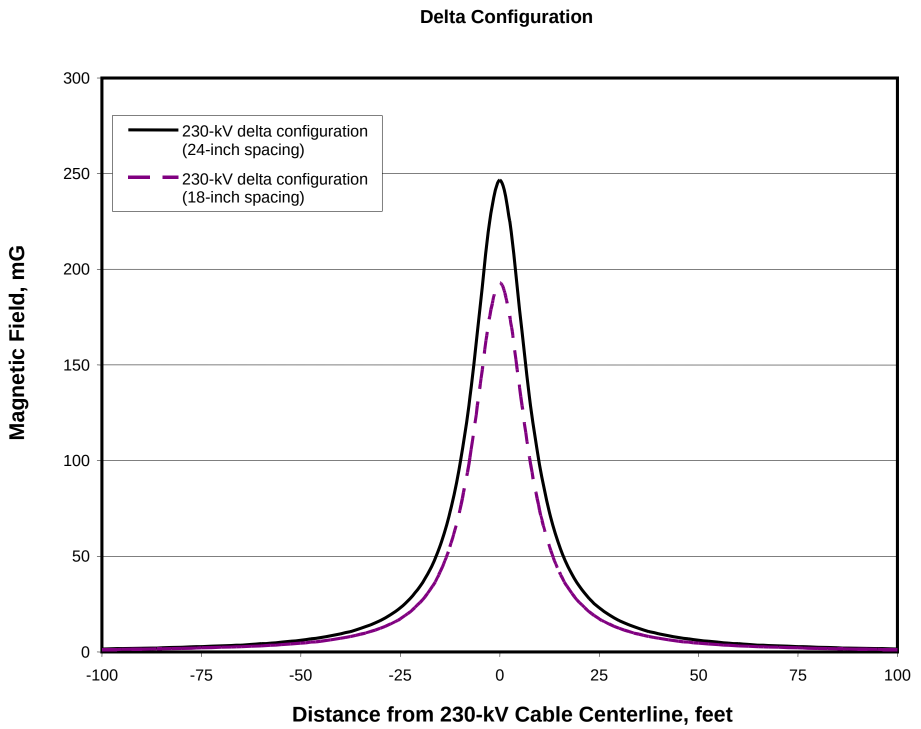


Table 3-18 Computed Magnetic Field in Milligauss for Proposed Terrestrial AC 230-kV Cable by Configuration, Cable Spacing, and Location

Cable Configuration	Flat		Delta	
Spacing, inches (m)	18 (0.45)	24 (0.6)	18 (0.45)	24 (0.6)
	Magnetic field (mG)			
Cable Centerline	418	541	193	247
15 ft (4.6 m) from Centerline	84	87	42	56
30 ft (9 m) from Centerline	24	33	12	16
50 ft (15 m) from Centerline	9.1	12.1	4.6	6.1
100 ft (30.5 m) from Centerline	2.3	3.1	1.2	1.5

A BPA overhead transmission line would need to be moved to the west, on BPA property to accommodate the interconnection work at Port Angeles Substation (see Figure 2-11). This line would also likely be reconfigured and existing field levels would change. The line would be moved farther to the west and would be closer to the residences on Porter Street. The line would, at its closest point, be about 125 feet (38 m) from Porter Street. The maximum calculated field levels would be about 1.77 mG at the east edge of Porter Street and with the average field level would be 0.7 mG. There would be no increased magnetic field exposure to homes along Porter Street due to the relocation of the transmission line on BPA property. There would be ***no*** impacts.

Radios, TV and Computer Monitors

Magnetic fields can cause distortion of the image on cathode ray tube TV or computer monitors. Plasma and LCD monitors are not affected. If interference should occur, there are various methods for correcting it. ***No-to-low*** impacts are expected.

3.11.2.2 Toxic and Hazardous Materials

Construction of the transmission cable would use petroleum products for fuel and lubricants. Minimal amounts of hazardous waste, such as oily rags, would be generated by the construction activities. Marine vessels would comply with existing regulations and mitigation measures to minimize the risk of fuel spills or releases of other toxic and hazardous materials. There would be ***no-to-low*** impacts.

HDD drilling mud consists of naturally-occurring bentonite clay mixed with water. Incidental concentrations of nonreactive heavy metals may be adsorbed onto the clay but would not react with other elements in the environment due to the strong cation capacity of the clay and inert molecular composition of the metals.

The HDD hole would pass beneath the former Rayonier pulp mill, which is a designated contaminated site. Contaminants occur in the surface sediments. Because of the proposed depth of the HDD hole, no contaminated soils or sediments are expected to be encountered during the drilling, so ***no*** impacts on contaminated soils or sediments are anticipated (see Section 3.5.4.2, Horizontal Directional Drill Hole). The contaminated marine sediments would be disturbed in the Port Angeles Harbor. But samples indicate that the sediments generally do not exceed the State of Washington Sediment Quality Standards (SQS). Impacts would be ***low***. See Sections 3.1, Water Resource, 3.3, Marine Habitat and Wildlife, and 3.5, Geology and Soils, for more information regarding dispersal of contaminated sediments.

Delivery, storage, and handling of construction materials for the converter station would occur on the project site. Any toxic or hazardous waste products (e.g., coolants containing benzene; other hazardous materials used during maintenance, testing, or construction of the transformers; solvents; wastewater with potential contamination or leachates; or other contaminated materials used for cleaning or construction) would also be collected and stored in a secure location prior to removal off site by an authorized waste handler. There would be ***no-to-low*** impacts.

Operation would not require use of toxic or hazardous materials, except for lubricants and/or solvents during routine maintenance procedures at the converter station. The transformers would contain water-soluble glycol and possibly other polymers for controlling viscosity such as glycerine within the coolant. The transformers would be in an enclosed building and oil spill containment would be provided. There would be ***no-to-low*** impacts.

Common construction materials would be used to expand the Port Angeles Substation, and to relocate or reconfigure existing transmission lines. BPA would follow strict procedures for disposal of any hazardous materials used. There would be ***no-to-low*** impacts.

3.11.2.3 Risk of Fire

The terrestrial DC and AC cables would have very little to no risk of causing a fire. The cables would generate heat, but not to the extent that fires would start. If excavating equipment accidentally severed the cable, an electrical arc could occur which has the potential of igniting nearby flammable materials. There would be ***no-to-low*** impacts.

The DC/AC conversion process has a potential risk for fire, but appropriate fire protection systems would be installed in the converter station. There would be ***no-to-low*** impacts.

Trees could fall on or grow too close to overhead transmission lines or into the converter station or substation yards and cause an electrical arc. An electrical arc would cause the line to turn off, and could start a fire on nearby flammable materials. Mitigation measures would be implemented to maintain a safe clearance between the tops of trees and power lines and substation equipment. There would be ***no-to-low*** impacts.

3.11.3 Mitigation Measures

- Obtain approval from the City of Port Angeles prior to construction in city streets.
- Provide detailed information about the location of the cable (as-builts) to the Port Angeles Engineering Department so construction crews can avoid it.
- Install concrete and warning tape above buried terrestrial cables to protect the cable from possible damage during future excavation in the street near the cable corridor.
- Record the location of the marine cable bundle on navigational charts. (Mitigation measure also listed in Socioeconomic Section.)
- Bury the cable bundle deep enough to provide protection, up to 12 feet (3.6 m), in areas of soft soils and potential ship anchorage. (Mitigation measure also listed in Socioeconomic Section.)
- Configure and locate buried AC cables and overhead transmission lines to lessen potential magnetic field exposures.
- Abide by all federal, state, and local requirements for the storage, handling, transport, disposal, and spill reporting requirements of all products and deleterious substances.

Personnel handling or transporting such materials would be adequately trained and, where necessary, material safety data sheets (MSDS) would be kept on hand.

- Ensure proper refueling procedures are followed and that containment materials are on hand at refueling locations.
- Maintain "good-housekeeping practices" within the hazardous material containment area, including prompt cleanup of spills.
- Place all transformers inside a bermed area large enough to capture the full potential volume of any oil spills or leaks from the equipment.
- Conduct periodic inspections around all transformers to look for any minor leaks or spills.
- Install appropriate fire detectors, sprinklers, and other fire safety equipment in the converter station.
- Remove vegetation and tall trees that could pose a danger to overhead transmission lines, converter station equipment, and electrical yards to prevent potential damage during large windstorms or from tree deadfalls.

3.11.4 Unavoidable Impacts Remaining After Mitigation Measures

Potential unavoidable public health and safety risks include accidental fire that may occur during construction and operation and maintenance, the use and accidental release of hazardous materials and accidental injury.

3.11.5 Environmental Impacts – No Action Alternative

The No Action Alternative would create ***no*** health and safety impacts.

3.12 Air Quality

3.12.1 Affected Environment

The EPA has established air quality standards for six criteria air pollutants (the pollutants for which there are National Ambient Air Quality Standards [NAAQS] as mandated by the Clean air Act):

- Ozone (0_3),
- carbon monoxide (CO),
- lead,

- oxides of nitrogen (measured as nitrogen dioxide,No_2),
- particulate matter (PM_{10}), and
- sulfur dioxide ($S0_2$).

According to the Washington State Department of Ecology, which regulates Washington's air quality program, "Air quality concerns come in three forms: public health, environment, and quality of life." The Department of Ecology states that studies have proven that short- and long-term exposure to air pollutants may cause lung, respiratory, and cardiopulmonary diseases, which can lead to decreased lung function, restricted activities, and/or hospitalizations. Air pollution may harm the environment through damage to soils, water, vegetation, and wildlife. Air pollution may also impair visibility, affect the climate, and create transportation hazards (Department of Ecology, 2003).

For each of the six criteria pollutants, EPA has determined a maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called NAAQS, and when an area exceeds one or more of these standards then it is designated as a non-attainment area for those pollutants (i.e., an area that has not attained the NAAQS for those pollutants). Pollution control measures are mandated for federal actions in non-attainment areas.

EPA imposes pollution controls on non-attainment areas in the form of an implementation plan. For non-attainment areas for PM_{10}, EPA will restrict PM_{10} emissions up to 70 tons/year.

EPA upgrades non-attainment areas to a "maintenance area" designation for areas that have since improved air quality to meet the EPA established air quality standards. The EPA imposes some pollution controls on maintenance areas, but the control standards are not as strict as in non-attainment areas. Attainment areas are all other areas not listed by the EPA for air quality degradation.

Port Angeles lies within the jurisdiction of the Olympic Region Clean Air Agency (ORCAA), which works in conjunction with the Department of Ecology and EPA to monitor Port Angeles ambient air. Air is monitored for particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns ($PM_{2.5}$), at Stevens Middle School in Port Angeles (ORCAA 2005). An Air Quality Index ranks air quality as Good, Moderate, Unhealthy, or Unknown based on PM-2.5 data. Historical data have shown that the air quality in Port Angeles is consistently ranked as Good. In 2003, most of the year was ranked as Good, with some moderate days in November and February.

The 2003 annual emission inventory for Clallam County lists commercial industries (such as Interfor Pacific, Nippon Paper Industries, K Ply, and Lakeside Industries) in Port Angeles that influence air quality and are monitored (ORCAA 2003). Besides commercial industries, western Washington's air is impacted by residential wood combustion, outdoor burning, and vehicular traffic.

The entire project area lies within Clallam County. Clallam County is not within an EPA-listed non-attainment area or maintenance area for any of the criteria pollutants. Therefore, Clallam County is in **attainment.**

3.12.2 Environmental Impacts - Proposed Action

Construction would affect air quality. Activities such as terrestrial trenching would create dust (particulate matter) and the heavy equipment required would emit exhaust pollutants. Because operation of the proposed project would not be expected to cause air emissions, no air quality impacts would occur from operation. Ongoing maintenance of the proposed project could result in similar type of impacts as construction, but likely on a much smaller and localized scale.

3.12.2.1 Dust Emissions and Control

Of the six criteria air pollutants, particulate matter is the main concern of construction activities. During the construction period, fugitive dust would likely arise from heavy construction activities in unpaved areas (the converter station site and Port Angeles Substation expansion area), and the transfer of mud and dirt from construction zones to paved roadways.

The amount of dust "kicked-up" is relative to the amount of small particle silt and moisture found in the soil. Generally, the coarser the soil material and the higher the moisture content, the lower the amount of surface dust that will enter the air. Soil in the area is well drained, gravelly sandy loam (see Section 3.5.2.1, Geology and Soils). Port Angeles has relatively high rainfall, and depending on the season in which construction would take place, the moisture content of the soil could be high.

Tree clearing and grading or terracing the sites would emit fugitive dust. The construction phase in which soil would be disturbed and exposed would be about 2 months for the converter station and about 4 months for the Port Angeles Substation interconnection.

Using the formula of acres total construction x 0.11 tons PM-10/acre-month x time= tons PM-10/acre-month, it is estimated that 5 tons (4.5 metric tons) of fugitive dust would be generated from construction of the converter station and Port Angeles Substation. The project is in an attainment area where there are no regulatory limits. The 5 tons (4.5 metric tons) of fugitive dust emission would be well below the most restrictive EPA allowable PM-10 level of 70 tons.

The HDD hole and terrestrial cable construction could also generate some dust through the removal of soil and hauling by dump trucks. However, the soil removed with the HDD hole work would be suspended in water and would not contribute to dust. The work in the street would expose limited amounts of soil at any one time and dump trucks would use measures to limit dust, if necessary.

Overall, because relatively very little dust would be generated from project construction, impacts to air quality from increases in particulate matter would be ***low***.

Following construction and any subsequent landscaping activities, emissions of fugitive dust would be limited to vegetation maintenance activities around the converter station and substation, and possible trenching work if cable repair was necessary. Due to their sporadic small-scale nature and likely very short (1 to 5 days) duration, there would be ***no-to-low*** impacts to air quality due to these maintenance activities.

3.12.2.2 Exhaust from Construction Vehicles and Equipment

Heavy equipment, ships, generators, and vehicles, including those with diesel internal combustion engines, would emit pollutants such as carbon monoxide, carbon dioxide, sulfur oxides, particulate matter less than 2.5 microns in diameter (PM-2.5), oxides of nitrogen, volatile organic hydrocarbons, aldehydes, and polycyclic aromatic hydrocarbons. Emissions would be spread over each construction phase and would be comparable to current conditions in Port Angeles (existing ship traffic, vehicle traffic, and periodic construction work). Impacts to air quality from construction exhaust emissions would be ***low***.

3.12.3 Mitigation Measures

- Apply water to exposed soils at construction sites as necessary to control dust.
- Clean accumulated dirt, as necessary, from roads along the cable construction corridor and near the converter station and substation sites.
- Implement dust control measures, as necessary, to limit dust releases from dump trucks (such as wetting dry soil).
- Seed or plant exposed areas as soon as practicable after construction, or as called for by permit, at the converter station site and Port Angeles Substation to reduce the potential for wind blown erosion. (Mitigation measure also listed in Water Resources, Vegetation and Wetlands, and Geology and Soils Sections.)
- Keep all construction equipment in good running condition to minimize emissions from internal combustion engines and ensure that odor impacts are kept to a minimum.
- To the degree practical, minimize equipment idling for long periods of time.

3.12.4 Unavoidable Impacts Remaining After Mitigation Measures

There would be some release of particulate matter in the form of dust and exhaust emissions and some degree of air pollution from vehicular emissions.

3.12.5 Environmental Impacts - No Action Alternative

The No Action Alternative would create ***no*** impacts to air quality.

3.13 Cumulative Impact Analysis

"Cumulative impacts" are the impacts on the environment which result from the incremental impact of an action – such as this Proposed Action – when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 C.F.R. 1508.7).

This section of the EIS describes existing development in the vicinity of the proposed project, as well as current and reasonably foreseeable future development planned for the area. Potential cumulative impacts also are analyzed and described. The past, present, and reasonably foreseeable future actions provide the context in which to assess the cumulative impacts of these actions in combination with the Proposed Action.

3.13.1 Existing Development

The nature and extent of existing development in the vicinity of the proposed project is largely described earlier in this chapter in the "Affected Environment" sections for each environmental resource. In general, urbanized uses have been developed since about the late 19th century along much of the Strait's shoreline in the project vicinity. These uses range from single-family residential to large-scale industrial and port uses, in the City of Port Angeles and adjacent areas. Historically, development in the area has been heavily influenced by marine-related activities, such as fishing and shipping, and by timber-related industries, such as harvesting and milling. Development in the area continues, with more emphasis currently on tourism and recreation. Due to continuing population growth and other factors, development is expected to continue into the future.

Along the shoreline either direction from Port Angeles and the proposed project, human development becomes more intermittent, with small communities interspersed with open space and forested areas. Much of the development in these communities is residential and marine related. To the south of Port Angeles is Olympic National Park, which dominates the interior portion of the Olympic Peninsula. Olympic National Park is generally undeveloped, but does have a visitor center, campgrounds, trails and other recreational features.

3.13.2 Reasonably Foreseeable Future Development

Reasonably foreseeable future development generally includes those actions currently underway, formally proposed or planned, or highly likely to occur based on available information. Various sources, including the City of Port Angeles, Peninsula College, the Port of Port Angeles and other local, state, and federal agencies were contacted to obtain information about any current and potential future development in the project vicinity. Reasonably foreseeable development that may occur in the vicinity of the Proposed Action could include the following (see Figure 3-12 for the general locations of this potential development):

- Peninsula College expansions. Peninsula College is in the initial stages of a multi-year campus expansion that will add several new buildings to the campus. These new buildings will include a Science and Technology Building to be constructed by 2007, a Library/Media Center and a Longhouse Cultural Center to be constructed by 2008, and a Business and Humanities Building to be constructed by 2010 (Graves, July 2006). Of these buildings, the Longhouse Cultural Center would be constructed closest to the proposed project; this building is proposed along the property line near the existing BPA Port Angeles Substation. Construction of these new buildings likely would require some tree clearing, vegetation removal, and ground disturbance. Increased traffic and air emissions from construction also would likely occur. Planned infrastructure to support the new buildings includes a new water line, which is proposed along the property line between BPA's Port Angeles Substation and the college.

- City of Port Angeles capital projects. For fiscal years 2006 to 2009, the City of Port Angeles has scheduled many varied capital projects throughout the city. These projects include a downtown convention center, street reconstructions and improvements throughout the city, and stormwater and wastewater projects (City of Port Angeles, November 7, 2006). No specific timeframes other than fiscal years 2006-09 are provided by the city for these projects. In addition, there is the potential that some of these projects could be cancelled or significantly delayed due to lack of funding, changing priorities, or other reasons.

- Elwha Dam and Glines Canyon Dam removals. The Elwha and Glines Canyon dams are two dams on the Elwha River, which flows northward from the Olympic Mountains in Olympic National Park to the Strait near Port Angeles. Elwha Dam is about 6 miles (9.7 km) west of the terrestrial portion of the proposed project, and Glines Canyon Dam is about 12 miles (19.3 km) southwest of this portion of the project. Private companies constructed these dams during the early 1900s. Elwha Dam, constructed during 1910-13, is a 105-foot (32-m) high concrete gravity dam that forms Lake Aldwell about 8 miles (12.9 km) upstream from the river's mouth. Glines Canyon Dam, built in 1927, is a 210-foot (64-m) high concrete arch dam that forms Lake Mills about 13 miles (21 km) upstream from the river's mouth. These two dams have no facilities for upstream anadromous fish passage, and their removal would provide an opportunity to restore an entire watershed to near-natural condition. In 2000, the U.S. Department of the Interior (DOI) purchased these dams in preparation for their removal. Among other environmental effects, removal of these dams could release up to 9 million yards^3 (6.9 million m^3) of sediment trapped within the two reservoirs behind the dams. After years of environmental study under NEPA, DOI released a Record of Decision in 2005 that documented its decision to undertake the removal of the two dams and provide flood, water quality, and water supply mitigation for impacts to downstream users. The selected plan for managing the sediment is to concurrently remove both dams, in controlled increments, over a two-year period. Rates of sediment erosion, transport, and deposition are to be intensively monitored during dam removal. Dam removal is expected to begin in 2008 (Bureau of Reclamation, 2006).

- Vancouver Island-Fairmont transmission cable project. Sea Breeze has identified a potential additional high voltage interconnection between Vancouver Island in Canada and the Olympic Peninsula in the United States. Sea Breeze has not proceeded with funding or applied for a Presidential permit or other permits for this possible project, but has submitted a request to BPA for interconnection for this project. Like the Proposed Action, this potential interconnection would be constructed as an underwater transmission cable that would primarily be located under the Strait. The cable would extend from Vancouver Island to an existing BPA substation at Fairmont, Washington, which is about 35 miles (56 km) east of Port Angeles at the southern end of Discovery Bay in Jefferson County. Environmental impacts associated with this potential cable would likely be largely the same as those described in this EIS for the Proposed Action. The timing and specifics of the potential Vancouver Island-Fairmont transmission cable project have not yet been determined by Sea Breeze. However, given that the necessary permitting work for this potential cable has not yet been initiated, it is unlikely that construction would coincide with construction of the Port Angeles–Juan de Fuca Transmission Project.

- Potential Improvements to transmission lines along the Olympic Peninsula. Although Sea Breeze's proposed project would be connected to BPA's transmission system without any system improvements (see Section 2.1.9, Transmission Service), it is possible that Sea Breeze or other parties may request that system improvements be made at some point in the future to allow the proposed cable to operate at its full capacity. Accordingly, it is reasonable to expect that these improvements could be proposed at some uncertain time in the future. A list of potential improvements from BPA's Port Angeles Substation to BPA's Olympia Substation that would likely be a subset of what ultimately could be required for full operation of the cable is identified in the *Olympic Converter, LP Transmission Interconnection System Impact Study* (BPA 2005).

  Since there has been no request for transmission service to send power from one point to another within the BPA system, it is impossible to determine the complete number of transmission system improvements that may be needed. Because of this uncertainty and the preliminary nature of these potential improvements, only general information is available concerning the type of improvements that might be needed and the resources that could be affected. Table 3.19 identifies possible transmission system improvements. Construction of these improvements could require tree and other vegetation clearing (and associated impacts to wildlife habitat), and could create impacts to wetlands, soils from erosion, streams and drainages from increased sedimentation and turbidity, and cultural resources, and socioeconomic effects from acquiring additional necessary right-of-way for the improvements.

Table 3-19 Potential Federal Columbia River Transmission System Improvements

Line Segment	Length	Possible Improvement
Between Olympia Substation and Shelton Substation	20 miles (32 km)	Install new conductor (wire) on two existing 230-kV lines (unknown whether new towers would also be required to hold new conductor). Replace an existing 115-kV line with a double-circuit 230-kV line.
Between Shelton Substation and Fairmont Substation	60 miles (97 km)	Replace two existing single-circuit 115-kV lines with a double-circuit 230-kV line and a single-circuit 230-kV line.
Between Fairmont Substation and Port Angeles Substation	27 miles (43 km)	Replace two existing single-circuit 230-kV lines with two double-circuit 230-kV lines.

3.13.3 Cumulative Impacts

The following subsections describe the cumulative effects that the Proposed Action, in combination with the past, present, and reasonably foreseeable future actions identified above, would have on the various environmental resources discussed in this EIS. Cumulative impacts from the combination of these actions could occur for each of the environmental resources. However, the contribution of the Proposed Action to these cumulative impacts would vary, with the greatest contribution occurring in cumulative impacts on water resources and marine habitat and wildlife. All potential cumulative impacts are discussed below.

3.13.3.1 Water Resources

Marine Water Resources

Past and present development and activities have cumulatively caused various impacts to the marine water resources of the Strait in the project vicinity, including fill of nearshore marine areas, adverse effects to water quality and marine sediments from stormwater runoff, wastewater discharges, and industrial activities such as the former Rayonier pulp mill, and increased turbidity from shipping and other marine-related activities. The cumulative impact of these activities has been greatest and more long-lived in nearshore areas with less water movement, such as Port Angeles Harbor. Deeper portions of the Strait have been less affected by these cumulative impacts, as demonstrated by the Strait's classification as a Class AA marine water (extraordinary water quality).

Reasonably foreseeable future actions with the potential to cumulatively affect marine water resources include the potential Vancouver Island-Fairmont transmission cable project and the planned removal of the Elwha and Glines Canyon dams. The Vancouver Island-Fairmont project would be expected to temporarily contribute to cumulative impacts to the water quality of the

Strait primarily through sedimentation, temporarily increased turbidity, and potential contamination from oil or fuel spills.

The 9 million yards^3 (6.9 million m^3) of sediments that could be released over several years after the Elwha and Glines Canyon dams are removed would also contribute to cumulative impacts in marine coastal areas near the Elwha River. About half of these sediments, or an estimated 4.5 million yards^3 (3.5 million m^3), could be transported to the Strait (Bureau of Reclamation, August 1996). Sediment deposits would be expected to largely replicate the natural distribution of sediments prior to dam construction. These sediments thus likely would be deposited at various locations including the river delta, Angeles Point, Ediz Hook, and the Strait in general. These sediments would cause temporary turbidity increases during transport, and could create new shoals and bars in portions of the Strait, depending on existing seabed contours and the coarseness of sediments. In the near term (5 to 10 years from the expected beginning of dam removal in 2008), the greatest amount of sediment release at any given time would likely occur immediately following dam removal activities and intermittently following extreme storm events.

The Proposed Action would contribute incrementally to adverse cumulative impacts to marine water resources, though only slightly and for a short time. During its construction, the Proposed Action would add to adverse cumulative impacts to marine resources through temporary sediment dispersal and increased turbidity in the Strait from trenching and cable laying activities. Possible adverse cumulative effects likely would be greatest if construction of the Proposed Action occurs at the same time as sediment releases from removing the Elwha and Glines Canyon dams. The Proposed Action would not be expected to contribute to cumulative impacts to marine resources from fill of nearshore marine areas, as the Proposed Action would not involve this type of fill. Similarly, the Proposed Action would not be expected to significantly contribute to cumulative impacts to marine resources from stormwater or wastewater discharges since the Proposed Action likely would not generate discharges that would reach the Strait.

Creeks and Streams

Past and present development and activities have cumulatively caused various adverse impacts to creeks and streams in the general project vicinity. Portions of some of these water bodies have been channelized or filled. Others have been affected by pollutants from stormwater runoff, wastewater discharges, industrial waste, and other sources. Reasonably foreseeable future actions could also contribute to these cumulative impacts. The Peninsula College expansions and the various City of Port Angeles capital projects could cumulatively impact the three creeks (White Creek, Ennis Creek, and Peabody Creek) in the immediate vicinity of the Proposed Action from increased sediment in stormwater runoff during construction, as well as through increased stormwater runoff from the development of additional impervious surfaces. In the Elwha River, the sediment released by removing Elwha and Glines Canyon dams would add to sedimentation in the downstream portions of the river and temporarily degrade the river's water quality by increasing turbidity. Creeks and streams along the rights-of-way for the Olympic Peninsula transmission lines improvements may be affected if rights-of-way are widened. Construction in expanded rights-of-way could increase stormwater runoff, and increase sedimentation and turbidity if construction equipment crosses drainage ways. Removing overstory vegetation could create thermal impacts to streams and wetlands.

The Proposed Action would incrementally contribute to adverse cumulative impacts to creeks and streams in the general project vicinity. In particular, the Proposed Action would potentially add to cumulative impacts to White Creek, Ennis Creek, and Peabody Creek during project construction from construction site stormwater runoff that would result in temporarily increased sedimentation and turbidity of these largely degraded water bodies. The Proposed Action and other cumulative projects also would have a longer-term adverse cumulative impact to these creeks through the addition of increased impervious areas, which would increase the amount of stormwater runoff to these creeks. Implementation of stormwater detention and other stormwater management practices for the Proposed Action would serve to minimize and possibly avoid project contributions to these cumulative impacts. The Proposed Action would not contribute to cumulative impacts to other water bodies in the area, such as the Elwha River or creeks and streams along the rights-of-way for the Olympic Peninsula transmission lines improvements, since the Proposed Action would not discharge toward or otherwise affect these water bodies.

Groundwater Resources

Cumulative impacts to groundwater from past and present development and activities in the general project vicinity have included groundwater withdrawals and areas of groundwater contamination. The reasonably foreseeable future actions would not be expected to cumulatively affect groundwater, except to the extent that construction activities affect shallow perched groundwater zones in the area. The Proposed Action could contribute to this cumulative effect, though slightly and only for a short time during trenching activities for the terrestrial portions of the proposed DC and AC cables.

3.13.3.2 Vegetation and Wetlands

Vegetation

Cumulative impacts to marine vegetation in the near shore areas of the Strait have occurred through disturbance and contamination from past and present development and activities. Of the reasonably foreseeable future actions, the potential Vancouver Island-Fairmont transmission cable project, and removing the Elwha and Glines Canyon dams would have the highest potential to contribute to cumulative impacts to this vegetation. The cable project would have construction impacts similar to the Proposed Action, and removing the dams would cause sedimentation that would cover some areas of marine vegetation, particularly near the mouth of the Elwha River west of Ediz Hook. The Proposed Action would contribute to the cumulative impacts to marine vegetation in the vicinity during its construction period from trenching and cable laying activities. Because of the dynamic nature of the seabed and marine vegetation that would be affected, it is expected that the cumulative impact of the cumulative projects would dissipate within a few years, as marine vegetation recovers and recolonizes.

Cumulative impacts to terrestrial vegetation in the project vicinity from past and present development and activities include vegetation removal and loss of former and potential habitat from conversion to developed areas. Reasonably foreseeable future actions would continue this trend. By removing trees and other vegetation and converting existing vegetated areas to developed uses, development of the Proposed Action would contribute incrementally, though in a relatively minor way, to these cumulative impacts.

Special-Status Plant Species

Plant species listed as threatened or endangered and other special-status plant species have been cumulatively affected by past and present development and activities through habitat loss and direct effects to individual species. This trend will likely continue as future development occurs in areas where these species are present. However, the Proposed Action would not contribute to this adverse cumulative impact because, as described in Section 3.2, the Proposed Action would not affect any threatened or endangered or other special-status plant species.

Wetlands

Past and present development and activities have cumulatively affected wetlands in the general project vicinity, primarily through fill and degradation associated with agriculture practices and urban development. Reasonably foreseeable future actions may contribute to these cumulative impacts if wetlands are present in areas that would be affected by these projects, although it is expected that most of these wetlands would be avoided where possible as part of the U.S. Army Corps of Engineer Section 404 permitting process for a particular project. As described in Section 3.2, the Proposed Action would not affect any wetlands. Thus, the Proposed Action would not contribute to the adverse cumulative impacts to wetlands in the project vicinity.

3.13.3.3 Marine Habitat and Wildlife

Marine Habitat

Potential cumulative impacts to marine habitat are described in Sections 3.1, Water Resources, and 3.2, Vegetation and Wetlands. As discussed in those sections, the Proposed Action would contribute to potential adverse cumulative impacts to marine habitat through impacts on water quality and marine vegetation, though only slightly and for a short time.

Marine Mammals

Marine mammals have been cumulatively affected by past and present development and activities. Development has modified habitat and the presence of humans has disturbed some species. Reasonably foreseeable future actions that affect the marine environment may contribute to these adverse cumulative impacts. The Proposed Action also would contribute incrementally to this cumulative impact during construction, as described in Section 3.3. However, after construction is complete, the Proposed Action would not be expected to have an effect on marine mammals including any special status species, and thus would not contribute to this cumulative impact.

Seabirds

Past and present development and activities has resulted in cumulative reductions in natural habitat, which has cumulatively affected seabirds that use these habitats. Some seabirds have adjusted to human presence and activities, while the populations of other seabirds (such as marbled murrelet) have declined. This trend will likely continue as future development occurs in areas where these species are present. However, the Proposed Action would not contribute to this because, as described in Section 3.3, the Proposed Action would not adversely affect any seabird species.

Other Marine Species

Marine fish and shellfish have been cumulatively affected by past and present human activities in the project vicinity, including habitat modification, disturbance, and harvest. These species also likely would be cumulatively affected by reasonably foreseeable future actions that affect the marine environment, such as the removal of Elwha and Glines Canyon dams and the potential Vancouver Island-Fairmont transmission cable project. The Proposed Action would contribute to this cumulative impact during its construction. In particular, sedimentation from the Proposed Action and other actions such as the dams' removal would likely bury and possibly kill immobile bivalves, such as the geoduck, in the general vicinity. In addition, construction and other activities associated with these actions could disturb marine fish, although these activities would not be expected to have a significant effect on any species' reproduction or survival. In fact, removing Elwha and Glines Canyon dams would be expected to cumulatively benefit marine fish species by restoring the Elwha River ecosystem to its natural state and opening up additional habitat for anadromous fish on the Elwha River. Since the impact of the Proposed Action would generally be temporary and only during the construction phase, the Proposed Action would not contribute to long-term cumulative effects to marine fish and shellfish.

Sea turtles are not known to occur in the project vicinity. It is unclear whether the cumulative projects have had a cumulative impact on sea turtles. The Proposed Action would have no effect on this species and would not contribute to cumulative impacts to this species.

3.13.3.4 Terrestrial Wildlife and Freshwater Fish

Wildlife and Wildlife Habitat

The establishment of Olympic National Park protected much of the native wildlife habitat in the area. The wildlife habitat in the immediate project vicinity though has been cumulatively impacted by a variety of past and present development and activities. Urban development and human occupation in the City of Port Angeles and other areas since approximately the 19th century has resulted in the cumulative loss of habitat. Wildlife habitat also has been cumulatively modified through activities such as logging and farming, which have fragmented habitat and converted formerly forested areas to predominantly grass and shrub habitat. This habitat loss and modification has resulted in the displacement of wildlife species. Reasonably foreseeable future actions would be expected to incrementally add to these cumulative impacts, with the exception of removing the Elwha and Glines Canyon dams. While demolition activities for removing these dams may temporarily disturb wildlife and wildlife habitat, it is expected that in the long-term, removal of these dams would increase the amount of wildlife habitat and provide greater habitat values.

The Proposed Action would add to the cumulative impacts of previous development in the City of Port Angeles and would lessen the amount of open undeveloped land within the city limits. Future development in the city would continue to reduce open space, adding to the cumulative impacts on wildlife habitat.

Development in the City of Port Angeles and surrounding areas also has had a cumulative impact on freshwater fish and their habitat through water quality degradation, fragmentation of habitat, and modification of habitat from channelization and culvert installation. The Proposed Action would have the potential to contribute to these impacts, though only through potential water quality degradation from stormwater runoff and sedimentation, and temporary construction activities.

Protected Species

Similar to general fish and wildlife species, protected fish and wildlife species have been cumulatively adversely impacted by a wide variety of past and present development and activities. Implementation of the reasonably foreseeable future actions would be expected to incrementally add to these cumulative impacts, with the exception of the removal of Elwha and Glines Canyon dams, which would restore habitat and thus provide additional habitat for protected species that may exist in the general project vicinity. The Proposed Action would not be expected to contribute to cumulative impacts to marbled murrelet or northern spotted owl because, as described in Section 3.4, the Proposed Action would not adversely affect these species or their habitat. The Proposed Action could contribute to cumulative impacts to bald eagles, though only slightly and for a short time during construction of the Proposed Action. In addition, mitigation measures are proposed in Section 3.4 that would avoid the Proposed Action's contribution to cumulative impacts to bald eagles if implemented.

The Proposed Action also could contribute to cumulative impacts to bull trout and Puget Sound steelhead, though only slightly and for a short time during construction. Similar to bald eagle, mitigation measures are proposed in Section 3.4 that would avoid the Proposed Action's contribution to cumulative impacts to these species if implemented.

3.13.3.5 Geology and Soils

Past and present development and activities in the project vicinity have resulted in cumulative impacts to geology and soils, primarily through increased erosion and soil disturbance and compaction. As the reasonably foreseeable future actions are developed, these actions likely would contribute to cumulative impacts. By developing currently undeveloped land and increasing the potential for soil erosion, the Proposed Action also would contribute to these cumulative impacts for the life of the project.

3.13.3.6 Land Use

The cumulative actions identified in Sections 3.13.1 and 3.13.2 have resulted in changes to land use and would be expected to continue the incremental growth of developed land uses in the project vicinity. The main exception to this trend would be the removal of the Elwha and Glines Canyon dams, which would return the river affected by these dams to a more natural state.

The Proposed Action would be consistent with existing land use planning and zoning designations for project facilities, and would not result in any inconsistencies with existing or planned adjacent land uses. The Proposed Action also would not alter existing land use patterns.

The Proposed Action would not be expected to adversely affect the overall capacity or ability to serve of any utility in the area, and thus would not contribute to cumulative impacts to utilities.

As discussed in Section 3.6, the Proposed Action could result in temporary and minor disruption of water service during trenching of the AC line. If other cumulative actions also result in disruption of water service, the Proposed Action would contribute to this cumulative impact. This cumulative impact could occur from multiple short-term disruptions of water service spread out over time, or through a longer-term disruption event if the cumulative actions occur at approximately the same time.

The Proposed Action would contribute to cumulative traffic levels in the project vicinity, but generally only during the construction phase of the Proposed Action.

3.13.3.7 Visual Resources

While much of the Olympic Peninsula remains undeveloped, past and present development and activities have changed the visual landscape in the immediate project vicinity by introducing manmade features and altering natural forms. Ongoing human activities in the vicinity also contribute to continuing cumulative visual impacts. Reasonably foreseeable future actions would be expected to continue this trend, with the exception of plans to remove Elwha and Glines Canyon dams. Removal of these dams would eliminate manmade features and return the Elwha River and its ecosystem to a more natural state. During project construction, the Proposed Action would contribute to cumulative visual impacts through visible construction activities, although some viewers interested in viewing project construction may consider the project's contribution to be a positive impact. After construction is complete, the presence of the proposed converter station and Port Angeles Substation expansion, as well as associated tree removal, would contribute to adverse cumulative visual impacts on nearby residents and motorists passing by on adjacent streets.

3.13.3.8 Socioeconomics

During construction, the Proposed Action may contribute incrementally to a positive cumulative impact on the economy of the local community by providing additional employment and increased need for goods and services. While the Proposed Action and other cumulative actions would increase the number of construction workers in the project vicinity, there appears to be sufficient vacant rental dwellings and available temporary housing, hotel/motel, camping, and RV units in the general project vicinity to accommodate the potentially overlapping construction schedules of the Proposed Action and some of the possibly concurrent cumulative actions such as the Peninsula College expansions and removal of the Elwha and Glines Canyon dams. The Proposed Action, in combination with cumulative actions that would affect the marine environment, may result in cumulative impacts to harbor and commercial fishing economic activity through temporary disruption of activities and temporarily increased turbidity during construction.

During operation, the Proposed Action would not affect population, employment, or housing and would not interfere with existing marine-related economic activity in the vicinity. Thus, operation of the Proposed Action would not be expected to contribute to cumulative socioeconomic impacts.

3.13.3.9 Cultural Resources

Marine Archaeology and Historic Resources

Cultural resources in the marine portion of the project vicinity generally include artifacts and other resources associated with the area's long-time maritime history, such as shipwrecks. These resources have largely been unaffected by the cumulative actions, although previous activities that significantly disturbed the seabed of the Strait may have adversely affected certain artifacts. Based on a review of sonar data, the Proposed Action would not be expected to affect any known marine archaeological or historic resources. However, there are four possible resources in the vicinity of the marine HDD hole end point, and undiscovered resources or artifacts may exist along the proposed cable corridor. Mitigation measures are identified in Section 3.9, Cultural Resources, to lessen or avoid the potential for this impact. However, if the Proposed Action does impact any marine resources or artifacts, it would contribute incrementally to the adverse cumulative impact to marine archaeological and historic resources in the area.

Terrestrial Archaeology and Historic Resources

Cultural resources in the terrestrial portion of the project vicinity have been and are being affected because of past, present, and current development and activities. These cumulative impacts include disturbance of cultural sites such as the precontact and ethnohistoric Klallam village, reduction of the cultural integrity of certain sites, increased encroachment on cultural sites, and removal of cultural artifacts. Although the Proposed Action would not affect any known upland archaeological or historic resources, there is the potential for the Proposed Action to impact previously undiscovered cultural resources or artifacts. Mitigation measures are identified in Section 3.9, Cultural Resources, to lessen or avoid the potential for this impact. However, if the Proposed Action does impact previously undiscovered cultural resources or artifacts, it would contribute incrementally to the adverse cumulative impact to cultural resources in the area.

3.13.3.10 Noise

Implementation of the cumulative actions identified in Sections 3.13.1 and 3.13.2 would be expected to generate various levels of noise through the project vicinity, as would the Proposed Action. Depending on the proximity and timing of these actions, there could be cumulative noise impacts if actions are undertaken simultaneously and in relative close relation to each other. For most of the cumulative actions, it is expected that they would not result in cumulative noise impacts due to temporal or spatial separation. However, given the expected timing of the Peninsula College expansions and City of Port Angeles projects in the immediate vicinity of the proposed project, it is expected that receptors in the area could be exposed to cumulative noise impacts during the construction of these projects in combination with the Proposed Action.

After construction of the Proposed Action, the only aspect of the Proposed Action that may result in elevated noise levels would be operation of the converter station. However, this noise generally would be consistent with noise levels in the project vicinity, and mitigation measures identified in Section 3.10, Noise, would serve to reduce noise levels from the converter station to general background noise levels. The Proposed Action thus would not be expected to contribute to longer-term cumulative noise impacts.

3.13.3.11 Health and Safety

Cumulative impacts could occur from existing or proposed AC or DC lines close to the route of the proposed cable that would cumulatively increase the overall level of EMF exposure. Currently, there are no existing underground AC or DC lines adjacent to the route of the proposed cable. In addition, there are no known future projects that would place underground transmission lines near or adjacent to the Proposed Action. While the potential Vancouver Island-Fairmont transmission cable project likely would involve construction of an underground cable, this future project would be far enough away from the Proposed Action such that they would not combine for a cumulative effect. Along much of the upland portion of the route, there are existing overhead AC distribution transmission lines, as well as AC lines associated with BPA's Port Angeles Substation. The electric and magnetic fields generated by the underground DC and AC cables under the Proposed Action, which are described in Section 3.11, Health and Safety, would contribute to the cumulative levels of EMF in the project vicinity, though only slightly because of cable shielding and undergrounding.

3.13.3.12 Air Quality

While past and present development and activities have resulted in some deterioration of air quality in the project vicinity, the cumulative effect of these activities on air quality has been fairly negligible. Overall, the air quality in the region is considered good, as evidenced by the fact that Clallam County is in attainment under U.S. EPA standards. Periodic air quality degradation occurs locally primarily during the winter months, from dust and emissions generated by construction activities, as well as occasional controlled burns. Construction of reasonably foreseeable future actions would be expected to generate dust and emissions during construction activities that could cumulatively contribute to air quality degradation. Construction of the terrestrial portions of the Proposed Action also would generate dust and emissions that likely would incrementally contribute, though slightly and only for a short time, to cumulative air quality impacts in the general project vicinity.

3.14 Intentional Destructive Acts

Intentional destructive acts, that is, acts of sabotage, terrorism, vandalism, and theft sometimes occur at power utility facilities. Vandalism and thefts are most common, and recent increases in the prices of metal and other materials have accelerated thefts and destruction of federal, state and local utility property. BPA has seen a significant increase in metal theft from its facilities over the past several months due in large part to the high price of metals on the salvage market. There were more than 50 burglaries at BPA substations in 2006. The conservative estimate of damages for these crimes is $150,000, but the actual amount is likely much higher since this number does not factor in all the labor-related costs associated with repairing the damage.

The impacts from vandalism and theft, though expensive, do not generally cause a disruption of service to the area. Stealing equipment from electrical substations, however, can be extremely dangerous. In fact, nationwide, many would-be thieves have been electrocuted while attempting to steal equipment from energized facilities. On Oct. 11, 2006, a man in La Center, Washington, was electrocuted while apparently attempting to steal copper from an electrical substation.

Federal and other utilities use physical deterrents such as fencing, cameras, warning signs, rewards, etc. to help prevent theft, vandalism and unauthorized access to facilities. In addition, through its Crime Witness Program, BPA offers up to $25,000 for information that leads to the arrest and conviction of individuals committing crimes against BPA facilities. Anyone having such information can call BPA's Crime Witness Hotline at (800) 437-2744. The line is confidential, and rewards are issued in such a way that the caller's identity remains confidential.

Acts of sabotage or terrorism on electrical facilities in the Pacific Northwest are rare, though some have occurred. These acts generally focused on attempts to destroy large transmission line steel towers. For example, in 1999, a large transmission line steel tower in Bend, Oregon was toppled.

Depending on the size and voltage of the line, destroying towers or other equipment could cause electrical service to be disrupted to utility customers and end users. The effects of these acts would be as varied as those from the occasional sudden storm, accident or blackout and would depend on the particular configuration of the transmission system in the area. While in some situations these acts would have no noticeable effect on electrical service, in other situations, service could be disrupted in the local area, or if the damaged equipment was part of the main transmission system, a much larger area could be left without power.

When a loss of electricity occurs, all services provided by electrical energy cease. Illumination is lost. Lighting used by residential, commercial, industrial and municipal customers for safe locomotion and security is affected. Residential consumers lose heat. Electricity for cooking and refrigeration is also lost, so residential, commercial, and industrial customers cannot prepare or preserve food and perishables. Residential, commercial, and industrial customers experience comfort/safety and temperature impacts, increases in smoke and pollen, and changes in humidity, due to loss of ventilation. Mechanical drives stop, causing impacts as elevators, food preparation machines, and appliances for cleaning, hygiene, and grooming are unavailable to residential customers. Commercial and industrial customers also lose service for elevators, food preparation, cleaning, office equipment, heavy equipment, and fuel pumps.

In addition, roadways experience gridlock where traffic signals fail to operate. Mass transit that depends on electricity, such as light rail systems, can be impacted. Sewage transportation and treatment can be disrupted.

A special problem is the loss of industrial continuous process heat. Electricity loss also affects alarm systems, communication systems, cash registers, and equipment for fire and police departments. Loss of power to hospitals and people on life-support systems can be life-threatening.

The Proposed Action is made up of many components. The marine cables would be, for the most part, in underground trenches at the bottom of the Strait. Access to these cables would be difficult and would require specialized equipment. The terrestrial cables, both DC and AC, would also be in trenches, mostly covered by pavement. Accessing them would require equipment or a destructive force that could go through the pavement.

The converter station and Port Angeles Substation expansion would be fenced to restrict access to authorized workers. Security cameras and other specialized equipment would be in place to safeguard the area.

Overhead transmission conductors and the structures that carry them are mostly on unfenced utility rights-of-way. The conductors use the air as insulation. The structures and tension between conductors make sure they are high enough above ground to meet safety standards. Structures are constructed on footings in the ground and are difficult to dislodge.

While the likelihood for sabotage or terrorist acts on the Proposed Action is difficult to predict given the characteristics of the project, it is unlikely that such acts would occur. Even if such an act did occur, it would not have a significant impact on the transmission system or electrical service since the Proposed Action would not be an integral part of BPA's main transmission system, and any impacts from sabotage or terrorist acts likely could be quickly isolated. In addition, the Department of Energy, public and private utilities, and energy resource developers include the security measures mentioned above and others to help prevent such acts and to respond quickly if human or natural disasters occur.

3.15 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

The proposed project including the converter station and expansion of BPA's Port Angeles Substation would not produce impacts that would significantly alter long-term productivity of the affected environment. The main activity that could potentially affect long-term productivity is the permanent alteration of 3.8 acres (1.5 ha) of trees, shrubs, and grass for construction of the converter station and the loss of about 1.5 acres (0.6 ha) of trees, shrubs, and grass for expansion of Port Angeles Substation. The construction of the marine transmission cable, including the plowed trench, would not change the long-term productivity of the Strait and seabed. The impacted area would likely return to its previous condition shortly after construction ends.

Other impacts that could potentially affect the long-term productivity of the Strait and seabed are potential thermal and electromagnetic field effects from the operation of the cable in a marine environment. However, the sediments directly above the cable at the sediment/water interface would only be subject to a slight increase in temperature of about 1 °F (0.5 °C); this heating effect drops off quickly, and, at about 10 feet (3 m) laterally from the cable, the sediment temperature would be unaffected. In the water column, the heat is transported away through free and forced convection, so minimal temperature rise would occur in the water. The slight increase in temperature of the sediment and interstitial water may result in a minor change in the mix of organisms using a narrow band above the cable, but this is unlikely to change the long-term productivity of the Strait and seabed.

As described in Section 3.11, because the cables are close together and have opposite voltages, the extremely low electric field produced by each cable is largely cancelled out. Because electric fields from buried cables are shielded by the grounding, soil, and water, the remaining net electric field would vary depending on surrounding conditions, but would always be low. The DC electric field near the earth directly above the cable would be about 0.004 kV/m, but this magnetic field would not affect the use or the long-term productivity of the Strait and seabed.

3.16 Irreversible and Irretrievable Commitment of Resources

The proposed project would consume aluminum, steel, other metals, wood, gravel, sand, plastics, and various forms of petroleum products in construction of the electric transmission cable and converter station. Most of these materials are not renewable and could potentially be an irretrievable commitment of resources if not recycled (metals and glass) or reused (sand and gravel) at the end of the life of the project.

Placement of the cable would not result in an irreversible and/or irretrievable commitment of resources.

Construction of the converter station, terrestrial AC line, and BPA’s Port Angeles Substation expansion would take place on partially cleared land zoned for utility use. Other than the 4.5 acres (1.8 ha) of trees that would be cleared for these facilities, construction and operation of these facilities would not result in a new irreversible or irretrievable commitment of resources.

3.17 Adverse Impacts that Cannot Be Avoided

Adverse impacts on some resources may not be avoided by the Proposed Action. Although the overall impact of the Proposed Action on resources in the project area may be minimized through mitigation, nonetheless an impact may still occur. Most of the unavoidable impacts will be of short duration and temporary because of site-specific activities.

Potential unavoidable adverse impacts include the following.

3.17.1 Construction

- Seabed plowing and laying of the cable across the Strait would cause a temporary increase of turbidity in the water column, temporarily disturb and displace marine species, and disrupt benthic habitat.
- Horizontal directional drilling and trenching activities in Port Angeles Harbor would cause a localized disturbance to marine species, temporarily increase turbidity in the water column, including through the release of drilling muds, remove marine vegetation (with expected re-colonization within one to two seasons), and disturb existing low-level contaminants in the Harbor.
- The HDD drilling activities on Liberty Street would temporarily impede traffic flow, increase noise levels from the drilling operation, and remove soils.
- Terrestrial trenching operations would temporarily impede traffic and increase noise levels from construction activities and blasting in certain areas.
- Construction of the converter station and interconnection work at Port Angeles Substation would remove vegetation and low-quality habitat, disturb and cover soils, cause a short-term increase in construction traffic near the project site, and incrementally increase the utility-related use of the area.

3.17.2 Operation

- The marine DC cable operation would cause a slight temperature increase in the water column directly above the cable and increase sediment temperatures changing benthic habitat in the area surrounding the cable.
- The marine and terrestrial DC cables would create a static extremely low-frequency magnetic field around the location of the cable.
- The terrestrial AC cable would create increase in the magnetic field around the location of the buried cable.
- The converter station would increase noise levels at the proposed site.
- Occasional maintenance or emergency repairs of the marine portion of the cable would temporarily increase turbidity levels slightly.
- Occasional maintenance or emergency repairs of the terrestrial portion of the project would temporarily increase noise levels and reduce traffic flow slightly.

4.0 Consultation, Review, and Permit Requirements

Several federal laws and administrative procedures must be met prior to approving or implementing the Proposed Action. This chapter lists and briefly describes requirements that would apply to the Proposed Action, actions taken to assure compliance with those requirements, and any agency consultation undertaken. This EIS is being sent to tribes, federal agencies, and state and local governments as part of the ongoing consultation process.

4.1 National Environmental Policy Act

This EIS was prepared pursuant to regulations implementing the National Environmental Policy Act (NEPA; 42 United States Code [USC] 4321 et seq.), which requires federal agencies to assess, consider, and disclose the impacts that their actions may have on the environment. DOE will consider the project's potential environmental consequences and public and agency comments when making decisions regarding the proposed project.

4.2 Endangered Species Act

The ESA (16 USC 1536) provides for the conservation of endangered and threatened species of fish, wildlife and plants. Federal agencies must ensure Proposed Actions do not jeopardize the continued existence of any endangered or threatened species, or cause the destruction or adverse modification of their habitat. When conducting any environmental impact analysis for specific projects, agencies must identify practicable alternatives to conserve or enhance such species.

Section 7 of the Act requires federal agencies to consult with the NOAA Fisheries Service (NOAA Fisheries) for marine and anadromous species, or with the United States Fish and Wildlife Services (USFWS) for fresh-water and wildlife species, if they are proposing an action that may affect listed species or their designated habitat. Possible impacts of the proposed facilities to known or suspected occurrences of federal threatened or endangered species or their habitat are discussed in Chapter 3 of the EIS. Table 3-3 gives the federally-listed species that are found in the marine environment that could be affected by the proposed project. Table 3-10 gives the federally-listed species that are found in the terrestrial and freshwater environments that could be affected by the proposed project. No threatened or endangered plant species are found in Clallam County.

If listed species or designated critical habitat are present and could be affected by the proposed project, a ***biological assessment*** (BA) must be prepared to analyze the potential effects of the project on listed species and critical habitat and make an effects determination. NOAA Fisheries and/or USFWS review the BA and, if they conclude that the project may adversely affect a listed species or their habitat, issue a biological opinion, which includes a take statement and a list of reasonable and prudent alternatives to follow during construction. If NOAA Fisheries and/or USFWS find that the project may affect, but is not likely to adversely affect a listed species or their habitat, they will issue a letter of concurrence.

An informational consultation meeting with state and federal representatives, including representatives from NOAA Fisheries and the USFWS, was held in Olympia, Washington on June 29, 2005. Potential issues related to the project were discussed, including the need to comply with the ESA for pre-application studies.

In addition to the informational meeting, further consultation with NOAA Fisheries included exchanging information on the potential impacts of conducting scientific research related to determining environmental conditions found at the project site. This consultation was conducted primarily through phone conversations and the exchange of scientific testing information and data via e-mail. A biological assessment is being prepared and will be submitted to both USFWS and NOAA Fisheries.

4.3 Fish and Wildlife Conservation Act

The Fish and Wildlife Conservation Act of 1980 (16 USC 2901 et seq.) encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. In addition, the Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires federal agencies undertaking projects affecting water resources to coordinate with the USFWS and the state agency responsible for fish and wildlife resources.

Sea Breeze has consulted with the Washington State Dept. of Fish and Wildlife and has incorporated recommendations to be consistent with state policy to avoid and minimize impacts to fish and wildlife of state and federal jurisdiction. Possible impacts of the proposed facilities to fish and wildlife species and their habitats are discussed in Chapter 3 of the EIS. Mitigation measures designed to minimize impacts to fish, wildlife and their habitat are listed in Chapter 3.

4.4 Marine Mammal Protection Act

The Marine Mammal Protection Act (16 USC 1361-1407) establishes a federal responsibility to conserve marine mammals, with management vested in the Department of Commerce for cetaceans and pinnipeds other than the walrus. The Department of the Interior is responsible for all other marine mammals, including sea otter, walrus, polar bear, dugong, and manatee. The Marine Mammal Protection Act generally assigns identical responsibilities to the Secretaries of the two departments.

Consultation prior to the preparation of the Draft EIS included obtaining a list of potential marine mammals that may be found in the project area from NOAA Fisheries' and USFWS' Web sites and the informational meeting held with agency representatives in Olympia, Washington on June 29, 2005. See Appendix A for additional information on the meeting.

In addition to the informational meeting, further consultation with NOAA Fisheries included exchanging information on the potential impacts of conducting scientific research related to the determination of environmental conditions found at the project site. This consultation was primarily handled through phone conversations and the exchange of scientific testing information and data via e-mail.

Possible impacts of the proposed facilities to marine mammals or their habitat and proposed mitigation measures to reduce impacts are discussed in Section 3.3 of the EIS. Because of the uncertainty of the level of underwater sound that may be generated by cable trenching, the project proponent or its agents will procure a letter for Incidental Harassment Authorization for a Level B take for causing potential disruption of behavior patterns in some marine mammals.

4.5 Magnuson-Stevens Fishery Conservation and Management Act of 1976

NOAA Fisheries is responsible for ensuring compliance with the Magnuson-Stevens Fishery Conservation and Management of 1976. In the exclusive economic zone (EEZ), except as provided in Section 102, the United States claims, and will exercise, sovereign rights and exclusive fishery management authority over all fish and all continental shelf fishery resources.

Beyond the EEZ, the United States claims and will exercise exclusive fishery management authority over all anadromous species throughout the migratory range of each such species, except when in a foreign nation's waters, and all continental shelf fishery resources.

Commercial fishing would not be affected by the Proposed Action. The proposed activities in the Port Angeles Harbor and in the Strait would not interrupt fishing or close any fishing areas. The area of geoduck habitat that would be trenched is outside the areas where harvesting geoducks is allowed. See Sections 3.3.2 and 3.3.3 for more information about potential impacts and mitigation.

4.5.1 Essential Fish Habitat

Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for Essential Fish Habitat (EFH): an EFH description in federal fishery management plans, and a requirement that federal agencies consult with NOAA Fisheries on activities that may adversely affect EFH.

The project proponent has prepared an Essential Fish Habitat report as part of the biological assessment (see Section 4.2). These reports have conservation measures to avoid and minimize impacts to essential fish habitat of federally-managed fish species. The proposed project would be constructed through Essential Fish Habitat, but based on the analysis in Sections 3.3.1.1 and 3.3.2.2, and the draft biological assessment, the impacts would be temporary and not significant.

4.6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC sections 703-712, July 3, 1918, as amended 1936, 1960, 1968, 969, 1974, 1978, 1986 and 1989) implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds. Under the act, taking, killing or possessing migratory birds or their eggs or nests is unlawful. Most species of birds are classified as migratory under the Act, except for upland birds such as pheasant, chukar and gray partridge.

The project would not be constructed on or near known waterfowl or shorebird concentration areas, or any other area acquired as a reservation for migratory birds. Nor would the project result in the take of a migratory bird. During construction of the project there is potential for migratory waterfowl and shorebirds to be temporarily displaced by construction noise and activity in the shallow water area of Port Angeles Harbor. Marine construction in the Harbor would take less than one week to complete, and displaced birds, if any, would forage in other areas along the Strait of Juan de Fuca. Impacts to migratory birds would be minor and temporary.

4.7 Bald Eagle and Golden Eagle Protection Act

The Bald Eagle Protection Act (16 USC 668-668d, June 8, 1940, as amended in 1959, 1962, 1972, and 1978) prohibits the taking of, possession of, and commerce in bald and golden eagles, with limited exceptions. Several bald eagle nests are located about 1 mile (1.6 km) east of the project; however the nests haven’t been occupied since 1998. During field surveys in April 2005, one juvenile bald eagle was observed perched on the bridge crossing at the mouth of Ennis Creek.

Because bald eagles may reside within foraging distance of the proposed project, work within the Harbor and horizontal directional drilling activity may cause noise that could potentially disturb bald eagles that may be foraging near Ennis Creek. This type of disturbance would not prevent bald eagles from completing any portion of their lifecycle to the extent that would reduce the health of any individual eagle or population of eagles. Because the Act covers only intentional acts, or acts in “wanton disregard” of the safety of golden or bald eagles, this project is not viewed as subject to its compliance. See also Sections 3.4.1.1 and 3.4.2 of this EIS.

4.8 National Marine Sanctuaries Act

The National Marine Sanctuaries Act (16 USC 1431 et seq., as amended by Public Law 104-283) identifies and designates as national marine sanctuaries, areas of the marine environment that are of special national significance, and manages these areas as the National Marine Sanctuary System.

The only national marine sanctuary in the vicinity of the project is the Olympic Coast National Marine Sanctuary, which extends 135 miles (217 km) along the Washington coast from about Cape Flattery to the mouth of the Copalis Beach (see Figure 3-1). The proposed project is about 80 miles (129 km) east of the Olympic Coast National Marine Sanctuary and project construction and operation would not impact the sanctuary.

4.9 Federal, Statewide, Area-wide, and Local Plan and Program Consistency

Some elements of the proposed project would be constructed by BPA, which is a federal agency. Pursuant to the supremacy clause of the U.S. Constitution, BPA is not subject to local and state land use or building regulations, and thus is not obligated to obtain state and local land use approvals or permits. BPA would, however, strive to meet or exceed the substantive standards and policies of state and local regulations.

Sea Breeze would be required to obtain applicable state and local land use approvals and permits. The proposed underground cable and converter station construction would be regulated by the City of Port Angeles, including the underground AC construction up to BPA's Port Angeles Substation.

4.9.1 Washington State Environmental Policy Act

The Washington State Environmental Policy Act (SEPA) was enacted in 1971 to ensure that governmental agencies in Washington state give proper consideration to environmental quality in making decisions on actions that may impact the environment. Under SEPA, an applicant proposing a project that requires state government action typically submits a SEPA Environmental Checklist to the appropriate state agency. This agency reviews the checklist and makes either a determination of significance (meaning a SEPA EIS is required) or a determination of nonsignificance (meaning no EIS is required). In the case of the proposed project, Sea Breeze submitted a checklist to the City of Port Angeles and Clallam County. The City of Port Angeles completed the SEPA process and issued a Determination of Non – Significance (DNS #1168) on July 14, 2006. Clallam County defers to the decision made by the City of Port Angeles.

4.9.2 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) was enacted October 27, 1972, to encourage coastal states to develop comprehensive programs to manage and balance competing uses of, and impacts to, coastal resources. The CZMA emphasizes the role of state decision-making regarding the coastal zone. Federal consistency requires that federal agency actions or activities that have reasonably foreseeable effects on the coastal zone be consistent with the policies of a coastal state's approved Coastal Management Program (CMP). In addition, CZMA requires compliance with the following state laws: Shoreline Management Act, Clean Water Act, Clean Air Act, State

Environmental Policy Act, Oceans Resource Management Act and compliance with the Energy Facility Siting Evaluation Council, if applicable.

Prior to publishing the Draft EIS, CZMA consultation was conducted with the City of Port Angeles, Clallam County, and the state of Washington. Although the Washington State Department of Ecology is charged with determining consistency with the CZMA program, they rely heavily on the local agency shoreline permitting process and issuance of a shoreline permit. Consultation included a preliminary meeting on June 24, 2005. The City of Port Angeles recommended approval of a Shoreline Substantial Development Conditional Use permit on August 9, 2006 and it was approved by the Washington State Department of Ecology on August 22, 2006. Based on an analysis of the applicable laws and policies and the issuance of appropriate permits provided for in the regulations, the project is consistent with the Washington State Coastal Zone Management Program.

4.9.3 Local Shoreline Management Program

The Port Angeles Shoreline Master Program, adopted in 1995 and amended in 2000, was prepared in accordance with the Washington State Shoreline Management Act of 1971. The City's Shoreline Master Program is intended to manage the uses and activities on the city's shoreline. Shoreline development is regulated through the city's shoreline permitting process. In a meeting with the City of Port Angeles on June 24, 2005, the need for a Shoreline Substantial Development Permit was discussed. It was also determined that a shoreline permit would be required from Clallam County since trenching for the cable would occur in their jurisdiction. On August 9, 2006, the City of Port Angeles recommended approval of a Shoreline Substantial Development Conditional Use permit. Subsequently, the Department of Ecology approved the shoreline permit on August 22, 2006. As with the SEPA determination, Clallam County defers to the decision made by the City of Port Angeles.

4.9.4 Noise

As discussed in Section 3.10, Noise, the HDD hole drilling operation would generate continuous noise (day and night) for about 22 nights and 23 days. To avoid damage to the equipment and potential loss of the integrity of the drilled hole, the drilling operations, once drilling is commenced, cannot be stopped, except in cases of emergency. By state and local regulations, construction noise is exempt from noise regulations between the hours of 7:00 a.m. and 10:00 p.m., but since the operation would be 24 hours per day, it would not meet local or state noise regulations. Sea Breeze applied for a City-approved variance from the noise ordinance to allow for continuous operation of the HDD drilling. Noise generated from the HDD operation would be about 90 to 95 decibels, A-weighted (dBA), slightly louder than typical construction noise levels; impacts would be high. The City of Port Angeles granted a noise variance on July 10, 2006.

There would be no new noise source at the BPA substation, so noise levels would not change.

4.9.5 Consistency with Local Plans

The City of Port Angeles Comprehensive Plan establishes the long-range goals and policies of the City; a base upon which City officials make land use and other decisions; and a tool that City staff uses to insure the desirable development of the City. Any project proposed in the City has to show that it is consistent with the Comprehensive Plan. The City of Port Angeles has eight elements in their comprehensive plan:

- Growth Management
- Land Use
- Transportation
- Utilities & Public Services
- Housing
- Conservation
- Capital Facilities
- Economic Development

Most of the goals and policies included in the elements of the comprehensive plan are not relevant to the proposed project. However, the most applicable element to the proposed project is Utilities and Public Service. Within this element the following goals and policies are most applicable:

Goal B - To support services and facilities through different levels of participation in cooperation with other public or private agencies.

<u>Policies</u>

1. The City should be the "primary responsible agency" and should take the lead in cooperation with other governmental entities to provide:

2. Utility and emergency services (water, sewer, electrical, stormwater, police, fire and emergency medical response services)

Goal C - To provide safe, clean, usable, and attractive public facilities which enhance the cultural, educational, economic, recreational, and environmental attributes of the City.

<u>Policies</u>

1. Industrial diversification should be supported by the development of urban services.

2. The City should place a high priority on installing new utility lines underground to increase safety and reliability and to improve neighborhood appearance.

3. Where possible, new utilities should be located in alleys.

The proposed project is consistent with the goals and policies, with the exception of Utilities & Public Services Goal C, Policy #3. However, constructing in alleys is limited since the alleys in the vicinity of the project are not oriented in the same direction as the project route.

4.9.6 Clean Water Act

Controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the U.S. Environmental Protection Agency (EPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also continued requirements to set water quality standards for all contaminants in surface waters. The Clean Water Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. The U.S. Army Corps of Engineers was given the authority to regulate and issue permits for the discharge of dredged or fill material into waters of the U.S. Some provisions of the Clean Water Act have been delegated by EPA to states, including the issuance of wastewater discharge permits including stormwater.

Consultation has included an agency consultation meeting held with the Seattle District, U.S. Army Corps of Engineers and other agencies on May 18, 2005.

Consultation with the Washington Department of Ecology to discuss issues and permits related to water quality impacts was held on June 29, 2005. Generally, this included potential impacts from trenching for placement of the cable, potential thermal impacts, and potential releases during the HDD hole operation.

Section 401 – Section 401 of the Clean Water Act, the State Water Quality Certification program, requires that states certify compliance of federal permits and licensees with state water quality requirements.

Section 402 – This section authorizes stormwater discharges associated with construction activities greater than 1 acre (0.4 ha). A National Pollutant Discharge Elimination System (NPDES) permit authorizes entities to do construction projects, provided notice is given to the authorizing agency and appropriate erosion control plans and measures are implemented. Sea Breeze will prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that would be overseen by Washington State Department of Ecology; BPA will prepare and implement a SWPPP that would be overseen by the Environmental Protection Agency.

Section 404 – Authorization for the U.S. Army Corps of Engineers is required when there is a discharge of dredge material or fill material into waters of the US, including wetlands. The trenching required for laying the cable is considered dredging and results in a displacement of sediment that requires a Section 404 permit.

The proposed project would likely be approved by the Corps of Engineers under a Section 10/404 Nationwide Permit #12, Utility Line Activities. Nationwide Permit #12 allows for the construction, maintenance, and repair of utility lines and associated facilities including substations in waters of the U.S. This includes wetlands provided the activity does not result in a loss of greater than 0.50 acre (0.20 ha) of non-tidal wetlands. The project would not result in a loss of wetlands (see Section 3.2, Vegetation and Wetlands).

4.10 Hydraulic Project Approval

To protect fish and shellfish and their habitat, particularly water quality and substrate conditions, Washington Administrative Code (WAC 220-110) requires a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife for any work that would use, divert, block, or change the movement or bed of fresh or salt water bodies. A Joint Aquatic Resources Permit Application for the HPA has been filed with WDFW. The proposed work, including timing limitations for work in the water, would be consistent with the requirements of WAC.

4.11 Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbor Act of 1899 requires a permit from the Army Corps of Engineers to construct, excavate, or fill in navigable waters of the United States. The proposed project will require a permit because laying the cable would require excavation and is considered construction.

4.12 Floodplain/Wetlands Assessment

USDOE regulations on compliance with Floodplains/Wetlands environmental review requirements (10 CFR 1022.12), and Executive Orders (EOs) 11988 and 11990 require an assessment of the impacts of the Proposed Action and alternatives on floodplains and wetlands. Neither the Proposed Action nor the No Action Alternative would impact any floodplains or wetlands (see Sections 3.1.2.7 and 3.2.1.4) and no mitigation is needed.

4.13 Executive Order on Environmental Justice

Executive Order (EO) 12898 on Environmental Justice requires agencies undertaking federal projects to evaluate whether any adverse human health or environmental impacts of the proposed project would fall disproportionately on low-income or minority populations in the analysis area, and ensures outreach to and involvement of minority and low-income communities in the decision-making process.

An important component of EO 12898 is assuring that all portions of the population have a meaningful opportunity to participate in the development of federal projects regardless of race, color, national origin, or income. Council on Environmental Quality guidance states that agencies should acknowledge and seek to overcome linguistic, institutional, geographic, and other barriers to meaningful participation, and should incorporate active outreach to affected groups. The public involvement process is described in Section 1.4, Public Involvement. The interested parties listed in Chapter 8 will be notified of the availability of this EIS and will be able to request a hard copy of the EIS, or access a copy at one of the libraries listed in Chapter 8, or access an electronic version via the BPA website.

The proposed route and/or corridor pass adjacent to or in the vicinity of upper and lower middle class single-family residences and commercial development. Most of the residents next to the proposed project construction corridor have an upper income level and no distinct concentration of minorities exists in the project area or in the city as a whole, so no disproportional impact to disadvantaged populations would occur as a result of the construction of the proposed project. See Section 3.8 for further information.

4.14 Marine Plastics Pollution Research and Control Act

The Act to Prevent Pollution from Ships (APPS) was amended by the Marine Plastics Pollution Research and Control Act of 1987, which implemented the provisions of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) relating to garbage and plastics.

The discharge of plastics, including synthetic ropes, fishing nets, plastic bags, biodegradable plastics, and other food and waste products into the water is prohibited.

To comply with the Marine Plastics Pollution Research and Control Act, provisions would be made for all garbage generated by the cable-laying vessel crew to be collected and stored on the vessel, and to follow the vessel's standard operating procedures (see Section 3.1.3). This includes other refuse that may be generated from the cable-laying operation such as plastic sheathing, plastic straps, and disposable construction material. When the vessel is at dock or serviced by a tender ship, the waste material would be transferred so it could be disposed of at appropriate facilities.

4.15 Oil Pollution Act of 1990

The Oil Pollution Act of 1990 seeks to prevent and better respond to oil spills, and prohibits a visible sheen or oil content greater than 15 parts per million within 10.4 nautical miles (NM) (12 miles or 19.3 kilometers [km]) of shore.

The Oil Pollution Act of 1990 requires that oily waste be retained on board and discharged at an appropriate reception facility. It also requires the development of a facility-specific Spill Prevention, Control, and Countermeasures (SPCC) Plan for the management of fuels and hazardous materials.

The intent of the Oil Pollution Act of 1990 (OPA90) was to establish liability and penalties for damages from oil or hazardous material spills in waters of the U.S., improve tanker safety, establish spill prevention and response procedures, and prohibit the discharge of oily wastewater. The proposed project would conform to the requirements of OPA90 by ensuring the cable-laying vessel has a valid and up-to-date SPCC plan. Under the regulations promulgated through the authority of OPA90, upland facilities that store over 1,320 gallons (6,000 l) of oil are also required to have a SPCC plan. The converter station would prepare a SPCC plan since it would exceed this amount of oil stored in transformers. To prevent spills into the stormwater drainage system or ground, the transformers would be designed with a secondary containment basin.

4.16 Historic Preservation

Numerous federal laws have been passed to protect the nation's cultural and historic resources, including the following:

- National Historic Preservation Act (NHPA) of 1966 (16 USC 470 et seq.), as amended;
- Archaeological Resources Protection Act (ARPA) of 1979 (16 USC 470 et seq.), as amended;
- Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 USC 3001 et seq.); as amended;
- Abandoned Shipwreck Act of 1987 (Section 4(2)(C)).

Cultural resources include objects, structures, sites, or a district that provides irreplaceable evidence of natural or human history of national, state, or local significance. However, cultural resources can also include traditions, beliefs, practices, and social institutions of communities, often collectively called traditional cultural properties.

Notifying potentially affected tribes regarding the Proposed Action included a meeting and consulting on a technical level with the Lower Elwha Tribe. Section 106 consultation letters with tribes and the SHPO can be found in Appendix B.

Results of the analysis for cultural resources are in Section 3.9. No known sites would be impacted by the project and it is not expected that undiscovered cultural resources are present. Additional survey work would be done along the marine corridor across the Strait prior to construction to help determine possible presence of sites and a Construction Monitoring and Discovery Plan would be prepared and implemented for the entire project to ensure no adverse effects would occur due to an inadvertent discovery. Please see Section 3.9.3 for cultural resource mitigation measures.

4.17 Global Warming

The mass transfer of carbon from the earth to the atmosphere and back again is called the carbon cycle. The atmosphere, plants, oceans, rocks and sediments act as reservoirs for carbon. Since industrial times, this carbon balance has been upset because of fossil fuel consumption and timber harvesting, and there has been a dramatic increase in the amount of carbon dioxide in the earth's atmosphere. Because carbon dioxide is a greenhouse gas, its increasing atmospheric concentration is thought to contribute to global warming.

The project would remove about 5.75 acres (2.33 ha), (3.75 acres [1.5 ha] at the converter station site and 2.00 acres [0.8 ha] at the BPA substation expansion site) of trees and other vegetation. Areas cleared for construction and not occupied by above ground facilities would be revegetated.

4.18 Energy Conservation at Federal Facilities

The only new federal facility would be a new relay house at BPA's Port Angeles Substation. The building design for the relay house would meet federal energy conservation design standards.

4.19 Pollution Control at Federal Facilities

Several pollution control acts apply to this project:

Resource Conservation and Recovery Act (RCRA) – The Resource Conservation and Recovery Act, as amended, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of this waste, and on owners and operators of treatment, storage and disposal (TSD) facilities. Each TSD facility owner or operator is required to have a permit issued by EPA or the state.

Typical construction and maintenance activities generate small amounts of these hazardous wastes: solvents, pesticides, paint products, motor and lubricating oils and cleaners. Small amounts of hazardous wastes may be generated by the project. These materials would be disposed of according to state law and RCRA.

Toxic Substances Control Act – This act is intended to protect human health and the environment from toxic chemicals. Section 6 of the Act regulates the use, storage and disposal of PCBs.

BPA adopted guidelines to ensure that PCBs are not introduced into the environment. No equipment proposed for the substation expansion would contain PCBs.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) – This Act registers and regulates pesticides. BPA uses herbicides only under controlled circumstances. Herbicides are used on transmission line rights-of-way and in substation yards to control vegetation, including noxious weeds.

When BPA uses herbicides, the date, dose and chemical used is recorded and reported to state government officials, as required by state law. Herbicide containers are disposed of according to RCRA standards.

4.20 Noise Control Act

The federal Noise Control Act of 1972 (42 USC 4903) requires that federal entities, such as BPA, comply with state and local noise requirements.

The new equipment at the BPA substation yard expansion would not create an increase in noise.

4.21 Emission Permits under the Clean Air Act

The Federal Clean Air Act as revised in 1990 (PL 101-542, 42 USC 7401) requires the EPA and states to carry out programs intended to assure attainment of the National Ambient Air Quality Standards. In Washington, EPA has delegated authority to the Department of Ecology.

The entire project area lies within Clallam County and is *not* within an EPA-listed nonattainment area or maintenance area for any criteria pollutants (see Section 3.12.1). The air quality in Port Angeles is consistently ranked as good. The area is currently in attainment for all criteria pollutants.

Section 160 of the Clean Air Act requires the protection, preservation or enhancement of air quality in national parks, wilderness areas and monuments. Olympic National Park is near the project area, but would not be affected by the project.

No emission permits would be required for the proposed project. Any impacts to air quality would be short-term and construction-related. See Section 3.12.2.

4.22 Underground Injection Permits under the Safe Drinking Water Act

No underground injection permits would be needed.

4.23 Notice to the Federal Aviation Administration

CFR Title 14 Part 77.13 states that any person/organization who intends to sponsor any of the following construction or alterations must notify the Administrator of the FAA:

- any construction or alteration exceeding 200 feet (61 m) above ground level;
- any construction or alteration;
- within 20,000 feet (6,000 m) of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with at least one runway more than 3,200 feet (975 m);
- within 10,000 feet (3050 m) of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 feet (975 m);
- within 5,000 feet (1500 m) of a public use heliport which exceeds a 25:1 surface
- any highway, railroad or other traverse way whose prescribed adjusted height would exceed that above noted standards;
- when requested by the FAA ; or
- any construction or alteration located on a public use airport or heliport regardless of height or location.

BPA, CPUD and the City of Port Angeles would need to move some transmission line structures as part of the Proposed Action. None of these structures would be in excess of 200 feet (60.96 m); the tallest structures are expected to be 80 to 100 feet (24 to 30 m) tall.

The closest airport is the William R. Fairchild International Airport, approximately 16,000 feet (4900 m) west-north-west of the transmission line structures. This airport has two runways, 6,350 and 3,250 feet (1,940 and 990 m) in length. Given the 100:1 scale requirement and a distance of approximately 16,000 feet (4900 m) from the eastern end of the 6,350 foot (1,940 m) runway (the nearest point to the project), structures cannot exceed 160 feet (49 m) in height. The area where the towers would be installed is 48 feet (15 m) above the elevation of the runway, therefore if structures exceed 112 feet (34 m), FAA would need to be notified.

Sequim Valley Airport to the east of the project is well beyond the guideline distances provided.

Based on these criteria, the project does not require filing notification to the FAA.

5.0 List of Preparers and Agency Contributors

Name	Project Role	Years' Experience	Highest Degree/ Discipline	Affiliation
Ackley, Sandra	Fish and Wildlife Administrator	10	B.S., Wildlife Biology; M.T.E., Education	BPA
Concannon, Kathleen	Assistant Environmental Coordinator	27+	B.S., Earth Sciences	Concannon Creative Services
Corkran, Doug	Fish and Wildlife Biologist	16	MA Environmental Planning	BPA
Critchlow, Barbara	Project Editor	34	B.A., English	Ecology and Environment, Inc. (E & E)
Dildine, Thomas E	Assistant Project Manager, Land Use, Visual Resources	16	B.S., Landscape Architecture	E & E
Fairbanks, Chris	Marine Resources	14	M.S., Marine and Estuarine Sciences	Fairbanks Environmental Services
Faulk, Kristina	Wildlife, Vegetation	3	M.S., Marine Resource Management	E & E
Gillilan, Tareyn	Air Quality	6	B.S., Chemical Engineering	E & E
Hanson, Al	GIS Analysis	26	6 years University of WA	E & E
Hodges, Charles	Cultural Resources	31	M.S., Archaeology	Northwest Archaeological Associates
Korsness, Mark	Project Manager	28	B.S. Civil Engineering	BPA

Name	Project Role	Years' Experience	Highest Degree/ Discipline	Affiliation
Liddicoat , Amy	EIS Coordination, Socioeconomics, Public Services and Utilities	12	B.S., Landscape Architecture	E & E
Longtine, Mark	Water Resources, Earth Resources	15	M.A., Geological Sciences	E & E
Mason, Stacy	Environmental Coordinator	19	B.A. Aquatic Biology	BPA
Pell, Jerry	Environmental Scientist	37	Ph.D., Meteorology Certified Consulting Meteorologist	DOE/OE
Roster, Noreen	Wildlife, Vegetation	16	B.A., Biology	E & E
Thornton, Jim	Project Manager, Public Health and Safety	31	B.A., Psychology	E & E
Williams, Richard	Project Director, Water Resources	20	B.S., Environmental Science	E & E
Zehntbauer, Nicole	Geographic Information Specialist	15	B.A. Geography	BPA

6.0 Agencies, Organizations, and Persons Receiving Notice of EIS

The project mailing list contains about 800 potentially interested or affected landowners; tribes; local, state, and federal agencies; utilities; public officials; interest groups; businesses; and libraries. They have directly received or have been given instructions on how to receive all project information made available so far, and they will have an opportunity to review the Draft and Final EIS.

6.1 Federal Agencies

Naval Station Bremerton
Naval Submarine Base (Bangor)
Navy Utilities/Engineering Field Activity (NW)
US Army Corps of Engineers (Seattle District)
US Department of Commerce, (National Marine Fisheries Service)
US Department of Energy
  Bonneville Power Administration KEC-4
  Permitting and Siting
US Department of the Interior (Fish and Wildlife Service)
US Environmental Protection Agency, (Region 10)
USDOI Fish & Wildlife Service (Nisqually National Wildlife Refuge Complex)
USN NW Division Bangor
USN Puget Sound Naval Shipyard
USN Division of Utilities

6.2 Tribes

Chehalis Business Council
Hoh Tribal Business Community
Jameston S'Klallam Tribe
Lower Elwha Klallam Tribe
Lummi Business Council
Makah Tribal Council
Muckleshoot Tribal Council
Nisqually Indian Community Council
Nooksack Indian Tribal Council
Northwest Indian Fisheries Commission
Port Gamble S'Klallam Tribe
Puyallup Tribal Council

Quileute Tribal Council
Quinault Indian Nation
Sauk-Suiattle Tribal Council
Shoalwater Bay Tribal Council
Skokomish Tribal Council
Snoqualmie Tribe
Suquamish Tribal Council
Swinomish Indian Tribal Community
Tulalip Board of Directors
Upper Skagit Tribal Council

6.3 Canadian Agencies

British Columbia Hydro & Power Authority
British Columbia Ministry of Energy, Mines, and Petroleum Resources
British Columbia Transmission Corporation
British Columbia Utilities Commission
National Energy Board

6.4 State Agencies

State of Washington
- Department of Archaeology and Historic Preservation
- Department of Ecology
- Department of Fish & Wildlife,(Western Washington)
- General Administration
- Department of Natural Resources
- Department of Community, Trade and Economic Development

State of Washington, House of Representatives District 24:
- Honorable Lynn Kessler – Representative
- Honorable Jim Buck – Representative
- Honorable James Hargrove – Senator
- Honorable Norm Dicks – Representative

US Senate
- Office of Senator Maria Cantwell, Robert Thorns
- Office of Senator Patty Murray, Mary McBride
- Office of Senator Patty Murray, Sarah McKinstry

6.5 Local Agencies

City of McCleary
City of Port Angeles, Department of Public Works & Utilities

City of Port Angeles, Department of Community and Economic Development
Clallam County, Department of Community Development

6.6 Universities and Libraries

Portland State University, Mark Hatfield School of Government
Washington Peninsula College
North Olympic Library System, Port Angeles Branch Library
Peninsula College Library
Washington State Library

6.7 Utilities

City of Port Angeles, Electric Utility
Clallam County PUD No 1
Grays Harbor County PUD No 1
Jefferson County PUD No 1
Mason County PUD No 1
Mason County PUD No 3
Whatcom County PUD No 1
Public Utility District No 1
Puget Sound Energy, Inc.
Seattle City Light
Snohomish County PUD No 1
Tacoma Power

6.8 Businesses and Special Interest Groups

Alcoa Inc
American Rivers
Bonneville Environmental Foundation
Bowman Holdings Inc.
Bowport Estates, Inc.
Chehalis Power Facility
Church of Christ of PA
Clallam Co Public Hospital District #2
Climate Solutions (Seattle & Olympia)
Cloud Nine LLC
E3C Hydro
FFP Inc
Fir Lane Terrace Convl Center
Friendswood Builders Inc
Gase-Nichols Properties
GMC Mortgage Corporation
Kanick Properties LLC
KONP Radio
London Parks Associates
Michael Karp & Associates
Micro Design Northwest
Mountaineers
National Wildlife Federation
Natural Resources Defense Council
Northwest Energy Coalition (Oregon & Seattle)

Northwest Sport Fishing Industry Association
Northwest Sustainable Energy for Economic Development
Olympic Coast National Marine Sanctuary (Clallam MRC)
Opportunity Council, Wap Energy Project
Orcas Power & Light Cooperative
Nippon Paper
Peninsula Daily News
People for Puget Sound
Port Angeles Community Players
Powerex Corporation
Puget Sound Energy Inc
Rayonier Properties, LLC
Real Property Mgmt LLC
Reg Midgley Motors Ltd
Renewable Northwest Project
Rycor lnc.
Ryker Construction & Engineering
Sandhu & Virk
Save Our Wild Salmon Coalition
School District #121
Shawn Properties LLC
Sierra Club (Portland & Seattle)
Snck Inc.
Sound Community Bank, Nationwide Rets
Suez Energy North America Inc
The Tate, LLC, a WA Corp
Tierra Right-of-Way Services
Time Oil Company
Town Home Investments LLC
TransAlta Energy Marketing (US) Inc.
TransCanada Energy Ltd
Washington Credit Union
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8.0 Glossary

8.1 List of Acronyms and Abbreviations

AC	Alternating Current
ACS	American Cetacean Society
ADFG	Alaska Department of Fish and Game
ADPA	Archaeological Data Preservation Act
ADT	Average Daily Traffic
APPS	Act to Prevent Pollution from Ships
ARPA	Archaeological Resources Protection Act
BA	Biological Assessment
BC	British Columbia
BC Hydro	British Columbia Hydro and Power Authority
BGS	Below Ground Surface
BMP	Best Management Practices
BPA	Bonneville Power Administration
°C	Degrees Celsius
CARA	Critical Aquifer Recharge Areas
CEQ	Council of Environmental Quality
cm	Centimeter
CMP	Coastal Management Program
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPCN	Certificate of Public Convenience and Necessity

CPUD Clallam County Public Utility District

CSL Cleanup Screening Level

CVTS Cooperative Vessel Traffic Services

CZMA Coastal Zone Management Act

dB or dBA Decibel or decibel (A-weighted)

DC Direct Current

DGER Division of Geology and Earth Resources [Washington State Department of Natural Resources]

DOE Department of Energy (US)

DOI Department of the Interior

DNR Department of Natural Resources [Washington State]

DNS Determination of Non-Significance

DWT Deadweight Tonnage

EA Environmental Assessment

EEZ Exclusive Economic Zone

EDNA Environmental Designations for Noise Abatement [Standards]

EFH Essential Fish Habitat

EIS Environmental Impact Statement

EMF Electric and Magnetic Field

EO Executive Order

EFH Essential Fish Habitat

EPA [U.S.] Environmental Protection Agency

ESA Endangered Species Act

ESU Evolutionarily Significant Unit

°F Degrees Fahrenheit

FAA Federal Aviation Administration

FCRTS	Federal Columbia River Transmission System
FERC	Federal Energy Regulatory Commission
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FR	Federal Register
ha	Hectares
HDD	Horizontal Directional Drilling
HVDC	High Voltage Direct Current
Hz	Hertz (a measure of frequency; 1 Hz = 1 per second)
JARPA	Joint Aquatic Resources Permit Application
kg/m	kilograms per meter
kHz	Kilohertz (1 kHz = 1000 Hz)
km	Kilometer
kph	Kilometers per hour
kV	Kilovolt (1 kV = 1000 Volts)
kWh	Kilowatt-hour
LOFF	Low-pressure fluid-filled [paper-lapped cable]
LPOF	Low-pressure oil-filled [cable]
mG	Milligauss (1mG = 1000 G)
MLLW	Mean Lower Low Water
MSDS	Material Safety Data Sheets
MSL	Mean Sea Level
MW	Megawatt (1 MW = 1 million watts)
MWh	One megawatt-hour = energy consumed or produced in one hour by a 1 MW device
N/A	Not applicable
NAGPRA	Native American Graves Protection and Repatriation Act

NCES	National Center for Education Statistics
NEB	National Energy Board
NEPA	National Environmental Protection Act
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Science
NLTAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Services
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Unit
OE	Office of Electricity Delivery and Energy Reliability
OPA90	Oil Pollution Act of 1990
OPAS	Olympic Peninsula Audubon Society
ORCAA	Olympic Region Clean Air Agency
OSB	Ocean Studies Board
PCB	Polychlorinated Biphenyls
pH	Power of Hydrogen [measure of the acidity of a solution in terms of activity of hydrogen]
RCRA	Resource Conservation and Recovery Act
RTPO	Regional Transportation Planning Organization
TDR	Time Domain Reflection meter
TSD	Treatment, Storage and Disposal [facilities]
SEPA	State Environmental Policy Act
SMS	Sediment Management Standards
SPCC	Spill Prevention, Control, and Countermeasures [Plan]
SQS	Sediment Quality Standards

SWPPP	Storm Water Pollution Prevention Plan
µPa	Micropascals
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geologic Survey
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

8.2 Glossary

Anadromous	Migrating from the sea to fresh water to spawn.
Audiograms	A graphical representation of how well an organism can perceive different sound frequencies.
Bathymetry	The measurement of water depth at various places in a body of water.
Benthic/Benthos	Benthic animals live in or on the benthos: the bottom of a water body. Epibenthic animals live on the sediment, and infaunal animals live in the sediment.
Bentonite	Bentonite is a naturally-occurring clay and is the principle substance used in horizontal directional drilling fluids, along with water.
Best management practices (BMPs)	A practice or combination of practices that are most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.
Biological Assessment	A document required by the Endangered Species Act, which requires an evaluation of potential effects on listed species and critical habitat prior to implementing a proposed action. Proposed action is defined as any activity authorized, funded or carried out by a federal agency.
Board Foot	A unit of measure equal to a board that is 1 inch thick, 12 inches long and 12 inches wide, or 144 cubic inches.

Biomagnification	Increase in concentration of an element or compound that occurs in a food chain.
British Columbia Hydro and Power Authority (BC Hydro)	A regulated public utility serving over 1.7 million residential, commercial and industrial customer accounts in British Columbia (BC). It is a crown corporation wholly owned by the Province of BC.
British Columbia Transmission Corporation (BCTC)	A provincial Crown corporation formed in May 2003, responsible for managing, operating, planning and maintaining most of the provincial electrical power transmission system and its interconnections with the North American grid.
Cable	Insulated conductor used for underground or submarine applications.
Capacitor	A device that maintains or increases voltage in power lines and improves efficiency of the system by compensating for inductive losses.
Capacity	The maximum load that a generator, piece of equipment, substation, transmission line, or system can carry under existing service conditions.
Circuit	A conductor or a system of conductors through which an electric current is intended to flow. In the case of an AC system, it is composed of three conductors and for DC systems, it is composed of two.
Circuit breaker	A control device for connecting or disconnecting a transmission line under normal load or emergency fault conditions.
Concrete blanket/mattress	A device made of concrete or grout that provides protection to segments of marine cable that cannot be trenched under the seabed.
Conductor	A wire or group of wires not insulated from each other, suitable for carrying an electrical current.
Construction	All activities associated with installation of the new transmission lines and underground and submarine cables, including modifications to existing facilities such as the substation.
Cumulative Impacts	The impacts on the environment which result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions.

Current	The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge).
dBA	The first two letters (dB) are an abbreviation for decibel, the unit in which sound is most commonly measured (see decibel). The last letter (A) is an abbreviation for the scale (A scale) on which the sound measurements were made.
Electromagnetic Fields (EMF)	The electric and magnetic fields produced wherever energized electrical equipment or appliances are transmitting voltage (electrical field) and current (magnetic).
Endangered Species	Those species officially designated by the US Fish and Wildlife Service or NOAA that are in danger of extinction throughout all or a significant portion of their range.
Federally listed	Species listed as threatened or endangered by the US Fish and Wildlife Service.
Fiber-optic lines	Special wire used for communication between one location and another.
Floodplains	That portion of a river valley adjacent to the stream channel which is covered with water when the stream overflows its banks during flood stage.
Frac Out	Term used in horizontal directional drilling for when a fracture in the substrate that occurs during drilling reaches the soil surface.
Gauss	Unit of magnetic flux density.
Grout blanket/mattress	See Concrete Blanket.
Hertz	Frequency/oscillatory rate of an alternating electric current, measured in number of cycles per second (1 Hz is equal to one cycle per second).
High Voltage Direct Current (HVDC) system	Type of power system in which electric current flows in a single direction and whose voltage magnitude is stable, or varies only slowly.
HVDC Light®	HVDC Light® is an ABB registered trademark for its cable product that uses voltage source converters (VSC) with pulse-width modulation to provide a stable current flow.

Hydro-jetting One of the proposed installation methods for the marine cable. Uses a remotely-operated machine that creates a trench and buries the cable. After the cable-laying ship unreels the cable and allows it to settle on the sea floor, the hydro-jetting machine follows the route and uses water to push or “fluidize” the sediment around the cable to create a trench.

Hydroplow One of the proposed installation methods for the marine cable. The force of the water enables the plow to create a trench. Water jets produce a downward movement that helps replace sediments within the trench to bury the cable.

Interconnection A specific connection between one utility to another.

Intertidal Area of the foreshore and seabed that is exposed to the air at low tide and submerged at high tide, i.e., the area between tide marks.

Kilovolt (kV) One thousand volts.

Loam Soil composed of a mix of sand, silt, and clay and humus.

Megawatt (MW) One million watts or 1,000 kilowatts.

Microns 1 micron = 1 micrometer = 1 meter/1,000,000.

Mitigation Steps taken to lessen the effected predicted for each resource, as potentially cause by the transmission project. They may include reducing the impact, avoiding it completely, or compensating for the impact.

Open Access Transmission Tariff Tariff adopted by BPA in which procedures provide for new interconnections to the transmission system to all eligible customers, consistent with all BPA requirements and subject to an environmental review under NEPA.

Piloting Methodology used during horizontal directional drilling process to form a pilot hole for the drill.

Polymer A chemical compound or mixture of compounds formed by combining two or more molecules to form larger molecules that contain repeating structural units.

Pullback Methodology used during horizontal directional drilling process during which carrier pipe is installed.

Reaming Methodology used during horizontal directional drilling process to enlarge the pilot hole in stages.

Resistivity	Measure of how strongly a material opposes the flow of electric current or heat.
Right-of-way	A corridor or lands reserved for placement of works such as a railway, transmission line or pipeline.
Riparian Zone	The interface between land and a flowing surface water body.
Sea plow	One of the proposed installation methods for the marine cable. A blade (plowshare) excavates sea bed materials and pushes sediment aside as it is pulled by a cable-laying ship.
Structure	Provides support for the overhead conductor. Structure types include wood pole or several wood poles together (i.e., H frame), steel or concrete poles, or lattice steel tower.
Submarine Cables	Transmission lines which are specifically designed to convey electrical current beneath the ocean with a typical diameter of 100 to 150 mm (3.9 to 5.9 inches).
Substation	A non-generating electrical power station that transforms voltages to higher or lower levels.
Thumper	Impulse generator that is used to locate a fault in the cable.
Till	Unsorted glacial sediment.
Transformer	Electrical device that changes the voltage in AC circuits.
Transmission Line	Refers to both existing as well as the proposed transmission lines, including any aboveground, underground and submarine transmission cables and structures within the project area.
Turbidity	Cloudiness or haziness of water (or other fluid) caused by individual particles (suspended solids).
Volt (V)	The unit of electromotive force or electric pressure which, if steadily applied to a circuit having a resistance of one ohm, would produce a current of one ampere.
Washington Inland Stock	Strait of Juan de Fuca/San Juan Islands.
Water-jetting	Use of focused high-pressure water-jets to fluidize a narrow trench in the sea bottom for cable burial. Divers can use water-jetting in shallow water, but it is most effective using specialized, neutral-buoyancy equipment.

Watt (W)
The electrical unit of real power or rate of doing work, equivalent to one ampere flowing against an electrical pressure of one volt. One watt is equivalent to about 1/746 horsepower, or one joule per second.

9.0 Index

A

B

C

D

R

S

T

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