Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marbled Murrelet, Bald Eagle, and Golden Eagle Lewis and Thurston Counties, Washington

Final Environmental Impact Statement

Lead Agency:
U.S. Fish and Wildlife Service
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COVER SHEET

Title of Proposed Action:	Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marbled Murrelet, Bald Eagle, and Golden Eagle.
Subject:	Final Environmental Impact Statement
Lead Agency:	U.S. Fish and Wildlife Service
County/State:	Lewis and Thurston Counties, Washington

Abstract: The Skookumchuck Wind Energy Project, LLC (Applicant), a wholly owned subsidiary of Renewable Energy Systems, Ltd., has determined that operations and maintenance activities associated with the Skookumchuck Wind Energy Project (Project) have the potential to result in take of marbled murrelet (*Brachyramphus marmoratus*), listed as federally threatened under the federal Endangered Species Act (ESA) of 1973, and bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), protected under the Bald and Golden Eagle Protection Act (BGEPA)—collectively, the Covered Species—and is seeking an incidental take permit (ITP) pursuant to Section 10(a)(1)(B) of the ESA, as amended (16 United States Code [USC] 1531 et seq., 1539) for take of the Covered Species that could result from Project operations and maintenance activities. Doing so would also confer take authorization as required under the BGEPA (16 USC 668–668c, 50 Code of Federal Regulations [CFR] 22.26[1]) without the need for a separate bald and golden eagle permit.

This Final Environmental Impact Statement (EIS) has been prepared for the U.S. Fish and Wildlife Service (Service) by Anchor QEA, LLC, pursuant to the National Environmental Policy Act (NEPA; 42 USC 4321 et seq.) to evaluate the effects of the Service's Proposed Action to issue the ITP for Project operation and maintenance (O&M) activities, limited to wind turbine generator (WTG) operation, maintenance, and site management. Key issues include the assessment of the potential for impacts associated with the different alternatives and the corresponding need to implement conservation strategies to offset these impacts on the Covered Species.

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[1] The BGEPA prohibits take specifically of bald and golden eagles. Permitting requirements are set forth in 50 CFR 22.26 and 74 Federal Register 46835.

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Introduction

This EIS, prepared by the Service, evaluates the effects of the Service's Proposed Action to issue an ITP pursuant to Section 10(a)(1)(B) of the federal ESA of 1973, as amended (16 USC 1531 et seq., 1539), for O&M activities associated with the proposed Project's WTG operation and site management. The proposed Project is located in Lewis County and Thurston County, Washington. Offsetting mitigation to benefit the marbled murrelet is proposed for lands in Pacific County, Washington, and abandoned or derelict fishing net removal is proposed in parts of the Salish Sea. Mitigation to benefit bald and golden eagles is proposed in partnership with PacifiCorp.

The Service, in coordination with the Applicant, has determined that Project O&M activities have the potential to result in incidental take of marbled murrelets (*Brachyramphus marmoratus*), listed as a threatened species under Section 4 of the ESA, as well as bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), protected under the BGEPA (16 USC 668–668c, 50 CFR 22.26). The Applicant is requesting incidental take coverage for all three species (collectively referred to as the Covered Species) from operation of 38 commercial wind turbines and associated site management in the form of a 30-year ITP, which includes a Habitat Conservation Plan (HCP) detailing the impacts and measures to minimize and mitigate take.

Because the Applicant has requested that the ITP only cover operations of the WTGs, the Service has identified and evaluated alternatives in this EIS that focus on Project O&M alternatives and additional conservation strategies that could be implemented to minimize take of the Covered Species. Project construction and decommissioning activities are evaluated in this EIS as connected actions consistent with 40 CFR 1502.4.

The Service held a 45-day public comment period for the Draft EIS and the Draft HCP from November 30, 2018, through January 14, 2019. During this time, the Service also hosted two open house public meetings in Chehalis and Lacey, Washington. All comments received during the public comment period and responses to substantive comments are included in Appendix A.

Proposed Action and Purpose and Need Summary

The proposed federal action being evaluated in this EIS is the issuance of an ITP pursuant to Section 10(a)(1)(B) of the ESA and the BGEPA (50 CFR 22.26). The purpose of the proposed federal action is to respond to the application submitted by the Applicant and to determine whether to approve, deny, or approve with conditions the ITP requested.

Summary of Alternatives

No Action Alternative

Under the No Action Alternative, the Service would deny issuance of the ITP to the Applicant. The Applicant had intended to construct the facilities prior to the Service's permit decision; however, it is possible that this may no longer occur. Therefore, the No Action Alternative consists of two options: Option A – No Project Operations and Option B – No Project Construction. Option A assumes the Project facilities would exist but remain non-operational for the duration of the requested ITP. Option B assumes the Applicant chooses not to construct the Project. Under Option A, project facility construction and decommissioning are considered connected actions as defined in 40 CFR 1508.25(a)(1), and the consequences of these activities are analyzed in this EIS.

Alternative 1 – Habitat Conservation Plan

Under Alternative 1, the preferred alternative of the Applicant, the Service would issue the ITP authorizing take of the Covered Species that could result from O&M activities (WTG operation and site management). Table S-1 includes a comparison of the estimated take of Covered Species of the Action Alternatives compared to the No Action Alternative. Alternative 1 would require the Applicant to implement the Project HCP (Chambers Group and WEST 2019), which includes avoidance, minimization, mitigation, and conservation measures that promote protection and enhancement of the Covered Species. Such measures include, but are not limited to, seasonal curtailment of select turbines, carrion monitoring and removal, purchase and management of conservation lands, derelict fish net removal, and eagle power pole retrofit program. A fatality monitoring and adaptive management program, as described in the HCP would also be implemented.

Table S-1. Estimated Take Comparison

Covered Species		Estimated Annual Take of Covered Species with Minimization				
Common Name	**Scientific Name**	**No Action Option A**	**No Action Option B**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Marbled murrelet	*Brachyramphus marmoratus*	0.50 murrelets per year	0	2.5 murrelets per year[1]	2.19 murrelets per year[1]	1.43 murrelets per year[1]
Bald eagle	*Haliaeetus leucocephalus*	Low	0	4.86 eagles per year	4.22 eagles per year	4.12 eagles per year
Golden eagle	*Aquila chrysaetos*	Low	0	1.65 eagles per year	1.43 eagles per year	1.51 eagles per year

Note:

1. This includes direct and indirect take associated with wind turbine operations. See Section 4.7 for discussion of estimated take.

Alternative 2 – Modified Project Site Design Alternative

Under Alternative 2, the Service would issue an ITP for a modified Project site design, authorizing a lower level of take for all Covered Species than Alternative 1. Under this alternative, five specific turbines closest to documented marbled murrelet nest locations would not operate. Operational parameters for the balance of the Project are assumed to be implemented as described in Alternative 1. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to minimize potential take would be less than but generally the same as Alternative 1. The amount of conservation land would likely remain the same because it is not functionally practical to obtain less land; however, the number of derelict nets removed would be fewer. With respect to bald and golden eagles, fewer power poles would be retrofitted to offset lower levels of take. The monitoring and adaptive management measures would be the same as Alternative 1.

Alternative 3 – Enhanced Curtailment Alternative

Under Alternative 3, the Service would issue an ITP for modified project operations, authorizing a lower level of take for all Covered Species than Alternative 1. Under this alternative, enhanced curtailment would be employed to reduce the probability of take during time periods associated with marbled murrelet breeding season (April 1 to September 30). This enhanced curtailment would apply to all 38 turbines during dawn and dusk periods corresponding with reported periods of increased flight activity to and from inland nests during the breeding season. Additionally, Alternative 3 would include the installation and use of IdentiFlight equipment for the full duration of the 30-year ITP. The mitigation that would be implemented to offset these levels of take and monitoring and adaptive management requirements would be similar to that under Alternative 2.

Summary of Environmental Consequences

Resources with Limited Potential Impacts Related to the Proposed Action

There is limited potential for differences in impacts from O&M activities for the majority of the resource areas when comparing the Action Alternatives to the No Action Alternative or to each other. This includes geology and soils, air quality, water resources, land use and recreation, visual resources, cultural and historic resources, tribal resources, transportation, noise, public services and utilities, health and safety, and environmental justice.

Resources with Likely or Notable Differences of Potential Impacts from the Proposed Action

There are likely to be some differences in environmental impacts when comparing the Action Alternatives to No Action for vegetation and wetlands and socioeconomics. There are minimal differences among the Action Alternatives. Impacts on these resources from the Action Alternatives would vary from No Action based on the level of mitigation that would likely be

implemented to minimize potential take of the Covered Species since mitigation-related activities would not occur under the No Action.

Resources likely to have more notable differences in environmental impacts among the Action Alternatives include wildlife and rare, threatened, and endangered species. These elements of the environment are discussed in greater detail in this EIS.

Cumulative Effects

Cumulative effects are the impact on the environment that results from the incremental impact of the 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 (40 CFR 1508.7). The potential for cumulative effects from each Action Alternative would mainly occur from collision-related fatalities affecting bird and bat species. Cumulatively significant impacts would be greatest for those species where the local populations are subject to additional risk factors that threaten population levels, such as is the case for the Covered Species.

Connected Actions

Connected actions are actions that are closely related to the Proposed Action and should be addressed in the same EIS (40 CFR 1508.25(a)(1)). The Applicant is not seeking take coverage for Project construction or decommissioning, and the Applicant could be liable if these unpermitted activities result in the prohibited take of the Covered Species. Although construction and decommissioning are not part of the Proposed Action, they are addressed as connected actions in this EIS.

The Applicant's proposed activities require (among other permits and approvals) a substantial shoreline development permit from Lewis County and a special use permit from Thurston County. These are the agencies responsible for implementing local land use regulations and ensuring the Project facilities are an allowed use of the land. Although these agencies do not have authority over all required permits, they are responsible for ensuring that the proposed location, construction, operation, and decommissioning of the Project demonstrate compliance with applicable local, state, and federal law consistent with county regulation and the Washington State Environmental Policy Act. Other local, state, and federal agencies are responsible for enforcing compliance with applicable regulations to ensure the Applicant meets required conditions prior to constructing and operating the Project. These requirements are in place to help minimize the potential impacts associated with these activities, such as disturbance and removal of vegetation; increased noise and activity; visual changes; land use changes; and related impacts on fish, wildlife, and the surrounding human environment.

Comparison of Alternatives

O&M activities would generally be the same for the Action Alternatives and, as noted previously, are not expected to substantially affect most environmental resources compared to the No Action Alternative. However, different levels of WTG operations would result in different levels of adverse impacts on wildlife species, including rare, threatened, and endangered species and particularly the Covered Species. Generally speaking, Alternative 1 would result in the highest impacts before the implementation of mitigation, followed by Alternative 2 and then Alternative 3. Similarly, lower levels of take would necessitate lower levels of mitigation under Alternatives 2 and 3. Although the differences are expected to be relatively minor compared to Alternative 1, Alternative 1 is the agency-preferred alternative because it would result in the highest level of mitigation.

Public Outreach

This section summarizes the outreach conducted by the Service during the development of this EIS, including the scoping and Draft EIS public comment periods.

Scoping

The Service issued a Notice of Intent (NOI) on May 3, 2018, to announce preparation of the EIS and to solicit public comments on the scope of the EIS. The public scoping process and comment period was held between May 7 and June 4, 2018. Two public scoping meetings were held on May 8 and 10, 2018, and 17 comment letters were received from federal and state agencies, non-governmental organizations, and the public during this period. The Service conducted outreach to agencies, tribes, and organizations listed in Chapter 7 during the development of this EIS.

Comments received during the scoping process raised several areas of concern, largely centered around the potential impacts to Covered Species. Concerns were raised that the NEPA EIS would not evaluate project siting, design, or construction, thereby limiting the opportunities to evaluate measures that might further avoid impacts of the Project on the Covered Species and other sensitive wildlife species. Concerns were also raised on the adequacy of take assessment studies, the HCP, and the avoidance, minimization, and mitigation measures on the level of take of Covered Species. Suggestions included additional curtailments of all WTGs during marbled murrelet breeding season; relocation or elimination of five turbines near known marbled murrelet nesting sites; use of detection technology such as IdentiFlight at the start of Project O&M; and conducting further analysis from a landscape perspective to develop a regional eagle electrocution model, prior to considering eagle power poles modifications. Additional studies were also recommended to better support the take assessments for Covered Species and to make such studies available for public review.

Draft EIS Comment Period

The Draft EIS was published in the Federal Register for public review on November 30, 2018, in accordance with requirements set forth in the NEPA (42 USC 4321 et seq.) and its implementing

regulations (40 CFR 1500–1508). Public comments were accepted for a 45-day period following publication of the Notice of Availability (NOA; 83 Federal Register 61664). Two public information meetings were also held during the comment period. During the comment period, comments were accepted on both the Draft EIS and the Draft HCP.

Substantive comments received during the public comment period include the following:

- Suggestions to consider alternate assumptions for take modeling of the Covered Species and the population viability analysis for marbled murrelets
- Suggestions to consider other information and studies to inform the analysis of potential environmental impacts
- Recommendations to evaluate additional alternatives not included in the Draft EIS (namely, the combination of Alternatives 2 and 3)
- Requests for clarification on permitting requirements and regulatory oversight for aspects of the proposed project that would not otherwise be covered by an ITP
- A request to extend the public comment period

Copies of all comments received, as well as the Service's responses to all substantive comments, are included in Appendix A.

1 Purpose and Need

1.1 Introduction

This EIS was prepared by the Service pursuant to the NEPA (42 USC 4321 et seq.). The EIS evaluates the effects of the Service's Proposed Action to issue an ITP pursuant to Section 10(a)(1)(B) of the federal ESA of 1973, as amended (16 USC 1531 et seq., 1539) and the BGEPA (16 USC 668–668c, 50 CFR 22.26) for O&M activities associated with the Project, located in Lewis County and Thurston County, Washington (Figure 1.1-1).

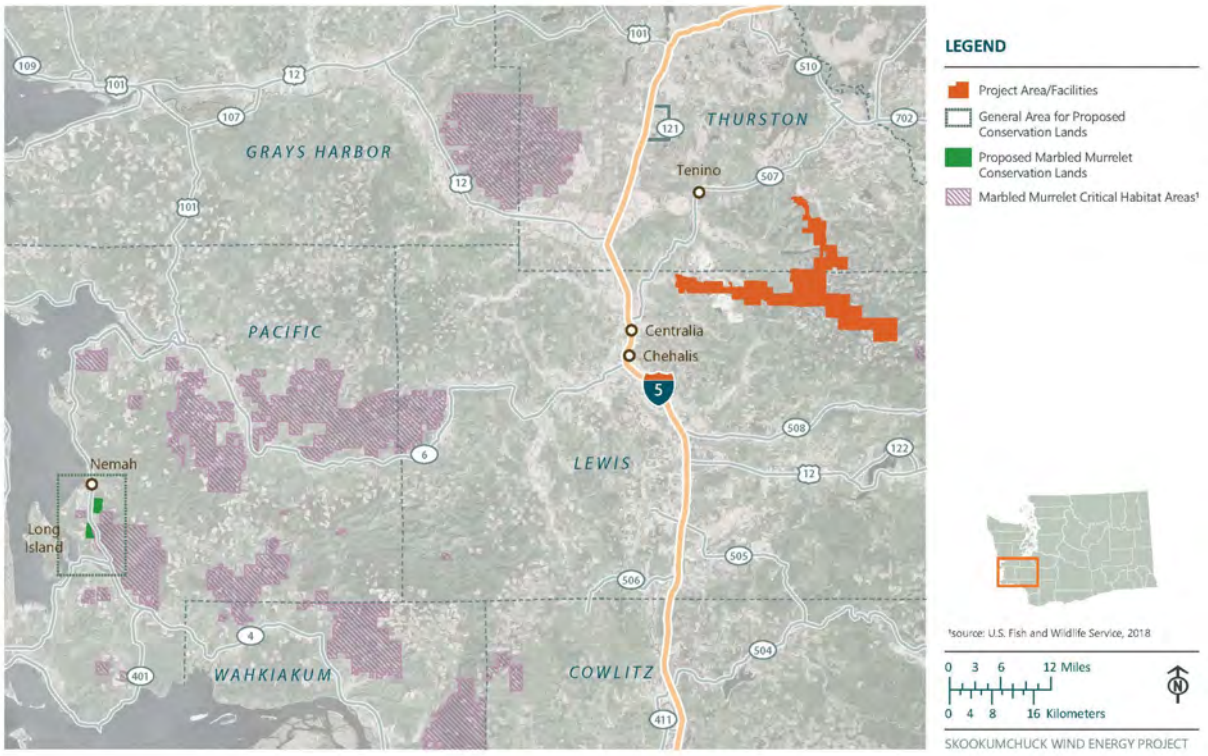

Figure 1.1-1. Vicinity Map (Project HCP; Chambers Group and WEST 2019)

1.2 Proposed Federal Action

The Service, in coordination with the Applicant, determined that O&M of the Project has the potential to result in take[2] of marbled murrelets (*Brachyramphus marmoratus*), which are listed as threatened under the ESA. Under Section 10(a)(2)(A) of the ESA, any application for an ITP must include an HCP that details, among other things, the impacts of the take and steps taken to

[2] The ESA defines "take" as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1532(19)). Pursuant to the CFR, "incidental taking" means "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 CFR 17.3). For a full definition of take under the ESA, refer to 50 CFR 17.3.

minimize and mitigate those impacts. The HCP may also cover other non-listed species, as appropriate. Because the Service and the Applicant identified the potential for take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), the Applicant requested incidental take coverage for all three species (collectively referred to as the Covered Species) in the form of a 30-year ITP. Issuance of an ITP would confer take authorization required under the BGEPA without the need for a separate bald and golden eagle permit (50 CFR 22.11[3]).

The Applicant intends to construct and eventually decommission the Project facilities in a manner that it believes would avoid take of the Covered Species and therefore has not requested an ITP that would cover take that could occur incidental to those activities. As such, the ITP would not cover construction, decommissioning, or any other activities outside of Project O&M. However, because the construction and decommissioning phases of the Project are interdependent with the O&M phase of the Project and have no independent utility apart from the O&M phase, the construction and decommissioning phases are considered connected actions for the purposes of this NEPA analysis (40 CFR 1508.25(a)(1)) and are analyzed as connected actions in this EIS.

1.3 Purpose and Need for Action

Non-federal applicants whose otherwise lawful activities may result in take of ESA-listed wildlife can apply to the Service for an ESA Section 10(a)(1)(B) ITP so that their activities may proceed without potential violation of the ESA Section 9 prohibition against such take. Additionally, the Service administers the BGEPA, including the incidental take of bald eagles and golden eagles where the take is compatible with the preservation of the bald eagle and the golden eagle, is necessary to protect an interest in a particular locality, is associated with (but not the purpose of) the activity, and cannot practicably be avoided.

In this matter, the Applicant has applied for an ITP under the ESA. If the ITP is issued, it would provide take coverage to the Applicant under both the ESA and the BGEPA. The Service's purpose is to respond to the application submitted by the Applicant and to determine whether to approve, deny, or approve with conditions the Applicant's ITP application. In doing so, the Service will fulfill its ESA Section 10 and BGEPA obligations.

1.4 Decision to be Made

On September 25, 2018, the Service received an application from the Applicant for an ITP under the authority of Section 10(a)(1)(B) of the ESA and the BGEPA (50 CFR 22.26). If the application is approved and the Service issues an ITP, the ITP would authorize the applicant to take marbled murrelets, bald eagles, and golden eagles associated with O&M activities for the Project.

[3] The BGEPA prohibits take specifically of bald and golden eagles. Permitting requirements are set forth in 50 CFR 22 and 74 Federal Register 46835.

As a condition of an ITP, an applicant must prepare and submit to the Service for approval an HCP containing the mandatory elements set forth under Section 10(a)(2)(A) of the ESA.

Under provisions of the ESA, the Service (under authority delegated by the Secretary of the Interior) will issue an ITP for take of an ESA-listed species if the application meets the issuance criteria identified in Section 10(a)(2)(B) of the ESA and implementing regulations.

In addition, consistent with BGEPA regulations found in 50 CFR 22.11, when an applicant voluntarily includes bald and or golden eagles as covered species in an HCP, it must provide the Service with information required under both Section 10(a)(2)(A) of the ESA and the BGEPA implementing regulations found in 50 CFR 22.26. The Service will evaluate whether the application for ITP coverage for bald and/or golden eagles meets the issuance criteria identified in both 50 CFR 22.26(f) and Section 10(a)(2)(B) of the ESA.

The Service will document its assessment of the ITP and HCP in an ESA Section 10 findings document and the NEPA Record of Decision. If the Service makes the requisite findings, the Service will issue the ITP and approve the HCP. In such cases, the Service will decide whether to issue the ITP conditioned on implementation of the proposed HCP as submitted or as amended to include other measures the Service determines are necessary or appropriate. If the Service finds that the requisite criteria are not satisfied, the permit request will be denied.

The Ecological Services staff continues to coordinate across programs to ensure that this EIS provides the information necessary for the Service's Pacific Region Migratory Birds and Habitat Program to determine whether including authorization to allow the incidental take of bald eagles and golden eagles is consistent with the intent and requirements of the BGEPA.

1.5 Scope of Analysis

The Applicant's Project consists of the O&M of 38 WTGs and support infrastructure, which generate up to 137 megawatts (MW) of renewable energy to help meet the requirements of the Washington Energy Independence Act (Revised Code of Washington [RCW] 19.285). The Project facilities are mainly located in Lewis County, Washington, with a new substation located in Thurston County. The proposed mitigation associated with the HCP also involves the purchase and maintenance of conservation lands in Pacific County, derelict net removal in the Salish Sea, and power pole retrofits proposed for the Pacific Flyway Eagle Management Unit (EMU).

The Applicant is requesting ITP coverage for the take of the Covered Species resulting from O&M of 38 commercial WTGs and associated site management. The Applicant is not seeking ITP coverage for take that may occur during the construction or decommissioning phases of the Project (e.g., through collisions with construction equipment, stationary wind turbines, or associated infrastructure) prior to the Applicant's completion of project construction and the initiation of

commercial power generation. Project construction and decommissioning are evaluated in this EIS as connected actions consistent with 40 CFR 1502.4 and 40 CFR 1508.25(a)(1).

To assist in further developing the scope of the EIS, the Service submitted an NOI (83 Federal Register 19569) on May 3, 2018, to announce the preparation of the EIS and solicit public comments. Subsequently, the Service issued an NOA (83 Federal Register 61664) on November 30, 2018, to announce the availability of the Draft EIS and Draft HCP and solicit public comments on both. Additional information about public outreach is presented in Chapter 7.

Other supporting information (including the list of preparers, literature cited, and abbreviations and acronyms used in this EIS) is presented in Appendix B.

1.6 Regulatory Context

Endangered Species Act. The ESA is administered by the Service and the National Marine Fisheries Service. The purpose of the ESA is to provide a means whereby the ecosystems upon which threatened and endangered species depend may be conserved and to provide a program for the conservation of such threatened and endangered species. Section 9 of the ESA prohibits the unauthorized take of any fish or wildlife species listed under the ESA as endangered (16 USC 1538). Under federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation (50 CFR 17.31). "Take," as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1532(19)).

Under Section 10 of the ESA, the Secretary of the Interior and Secretary of Commerce may, where appropriate, authorize the taking of federally listed fish or wildlife if such taking occurs incidentally to otherwise legal activities. The Service is charged with regulating the incidental taking of listed species under its jurisdiction. The submission of the ESA Section 10(a)(1)(B) permit application requires the development of an HCP designed to ensure the continued existence of the species (i.e., the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild) while allowing for any limited, incidental take of the species that might occur during the construction and operation of the project or during mitigation activities. The implementing regulations for Section 10(a)(1)(B) of the ESA, as provided in 50 CFR 17.22, specify the requirements for obtaining a permit allowing the incidental take of listed species pursuant to otherwise lawful activities.

Bald and Golden Eagle Protection Act. An ITP under the BGEPA can authorize the take of eagles that is associated with (but not the purpose of) an activity. The BGEPA was originally passed in 1940 to protect bald eagles, the national symbol. The BGEPA was later amended in 1962 to protect declining populations of golden eagles. The implementing regulations, 50 CFR 22, authorize the incidental take of eagles as well as purposeful take, such as scientific

collecting, exhibition, depredation, and falconry. Permits are administered by the Regional Migratory Bird Permit Offices and can be combined with other permits and authorizations such as HCPs. The ITP, if issued, would also serve as the eagle take authorization for this project.

2 Alternatives Including the Proposed Action

This chapter describes the Action Alternatives as well as the No Action Alternative specific to O&M of the Project. The Project facilities, construction, and decommissioning are addressed in Chapter 5. Cumulative effects are addressed in Chapter 6.

The Council on Environmental Quality regulations direct that an EIS shall ". . . rigorously explore and objectively evaluate all reasonable alternatives . . ." (40 CFR 1502.14). Guidance from the Council on Environmental Quality further explains, "When there are potentially a very large number of alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS" (46 Federal Register 18027). The purpose and need for action dictate the range of alternatives that must be analyzed, because Action Alternatives are not reasonable if they do not respond to the purpose and need for the action (BLM 2008).

For this Project, there are potentially endless variations in design features or combinations of different plan components. The Service has designed the range of Action Alternatives in this EIS to span the full spectrum of Action Alternatives that would respond to the purpose and need for the action. The Action Alternatives represent a range of approaches rather than exemplify gradations in design features. Nevertheless, the Action Alternatives do not provide all possible combinations of operational components. There are components of the Action Alternatives that are somewhat separable, and the Service may combine elements from different Action Alternatives in developing the eventual permit decision.

2.1 Project Location

The Project would be located in Lewis and Thurston counties, approximately 42.5 kilometers (26.4 miles) southeast of Olympia, 27.4 kilometers (17 miles) southeast of Tenino, Washington, and 33.8 kilometers (21 miles) east of Chehalis and the Interstate 5 (I-5) corridor (Figure 2.1-1). The Applicant intends to construct the Project in avoidance of take as discussed in greater detail in Chapter 5. The Project would operate 38 WTGs and associated support facilities, including a new substation, O&M facility, and transmission line to connect to the Puget Sound Energy service grid. These facilities are described in greater detail in Section 5.1.1.

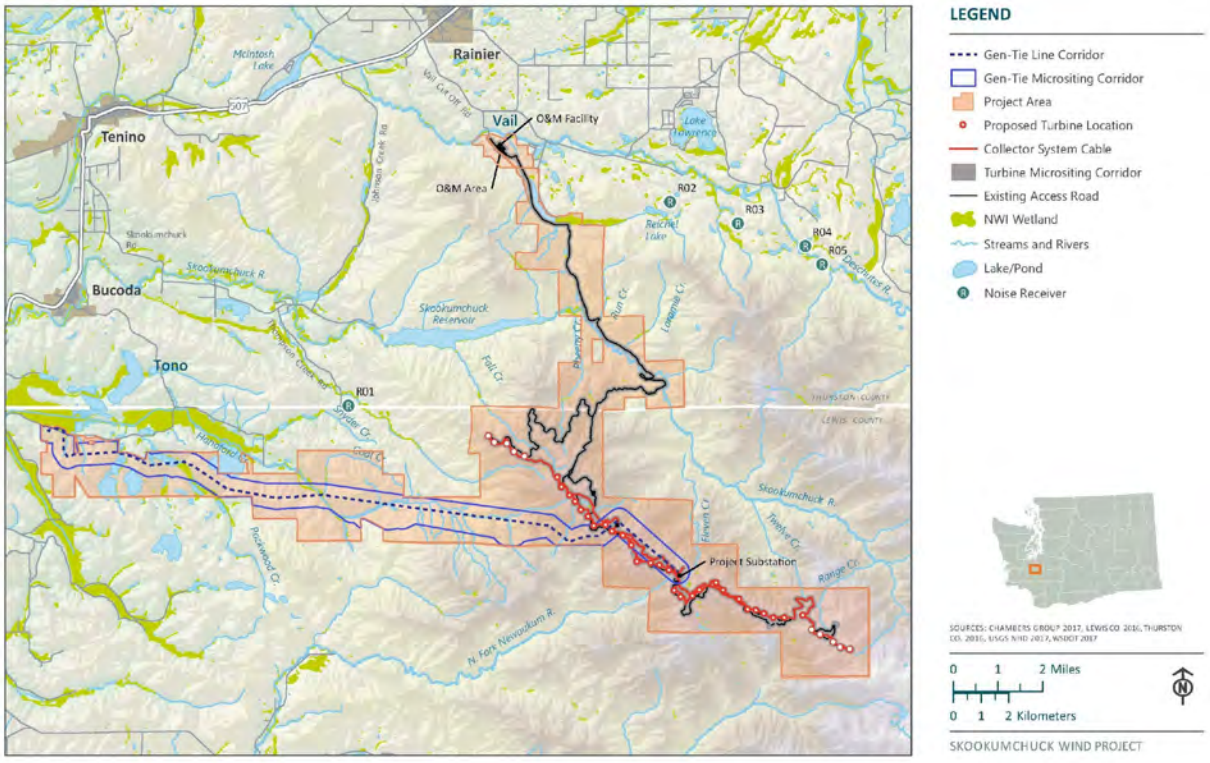

Figure 2.1-1. Project Area and Facilities

2.2 No Action Alternative

Under the No Action Alternative, the Service would deny issuance of the ITP to the Applicant for Project O&M and therefore would not authorize take of the Covered Species that may occur incidental to these activities. The Applicant originally asserted that it intended to initiate construction of the facilities prior to the Service's permit decision. However, best current information indicates that construction would occur over a 9- to 12-month period, beginning by mid-2019. Therefore, the Service has determined that the appropriate scope of the No Action Alternative consists of two options: Option A – No Project Operations, and Option B – No Project Construction.

Option A assumes the Applicant would construct the Project, as was originally planned, before the Service makes a final permit decision. Because the Applicant would not have the regulatory assurance requested to avoid potential violation of the ESA or BGEPA, it is assumed that the Applicant would not operate the Project without the ITP. Under Option A, the constructed facilities would exist but remain non-operational for the duration of the requested ITP. Construction and decommissioning activities are described in Sections 5.1 and 5.2, respectively.

Because the decision to construct the Project is interrelated to the Service's ITP determination, construction and decommissioning are connected actions as defined in 40 CFR 1508.25. The consequences of these actions are addressed in Chapter 4 and described more fully in Chapter 5 of this EIS. Under Option A, the Applicant may be liable for unpermitted take associated with construction and decommissioning.

Option B assumes that the Applicant does not construct the Project. Under this scenario, nothing would change from current conditions and no impacts would result from the Project. Although both Options A and B mean the Applicant would be unable to fulfill all the terms of its Power Purchase Agreement with Puget Sound Energy, inclusion of the No Action Alternative is prescribed by the Federal Council on Environmental Quality regulations (40 CFR 1502.14(d)) and is carried forward for analysis in the EIS.

2.3 Alternative 1 – Habitat Conservation Plan

The Applicant applied for an ITP providing take coverage for Covered Species while conducting Covered Activities. Covered Activities would include the operation of 38 WTGs, maintenance of those WTGs, and site management activities that are described in Section 2.3.1 of this EIS. ITP coverage for Covered Activities would begin once the turbines are commercially operational and the Project begins transmitting commercial power to the Puget Sound Energy power grid. ITP coverage would extend to each of the 38 operational WTGs, whether their turbines are rotating or stationary during any time of day. The requested permit term is 30 years.

Covered Activities would not include the following: 1) transmission lines (also referred to as gen-tie lines); meteorological towers; or any associated structures, facilities, or infrastructure (with the exception of operational WTGs, as described previously); 2) maintenance or operation of transmission lines; meteorological towers; or any associated structures, facilities, or other infrastructure; and 3) construction, erection, or decommissioning of any Project structure, facility, feature, or infrastructure, including without limitation any WTGs, meteorological towers, or transmission lines.

Under Alternative 1, the Service would issue the ITP authorizing take of the Covered Species at the levels described in Section 4.7 as requested by the Applicant. Issuance of the ITP would require the Applicant to implement the operating and conservation measures described in the Project HCP (Chambers Group and WEST 2019) and summarized in the following sections. If Project construction had not already occurred, issuance of the ITP would likely result in the activities described in Section 5.1.

2.3.1 Operations and Maintenance Activities

While the Project would be capable of operating 24 hours per day, 365 days per year, under Alternative 1, operations would be curtailed to minimize the potential for take of the Covered

Species. Specifically, 10 of the WTGs would not operate for 3 hours each morning seasonally from May 1 to August 9. Total theoretical annual operating hours for each alternative, not accounting for further reductions that may occur from variable wind conditions or maintenance downtime, are shown in Table 2.3-1 based on the assumption that WTGs would be fully operational unless otherwise modified or curtailed. Further curtailment would also occur related to the testing of IdentiFlight to further minimize impacts on the Covered Species. Details about these and other minimization measures are described in Section 2.3.2.2.

Table 2.3-1. Total Annual Operational Hours by Alternative

Alternative	Operational WTGs	Seasonal Variation	Operational Hours per Day	Total Operating Hours per Year/% of Alternative 1 Levels
No Action Option A	0	No	0	0/0%
Alternative 1	38	Yes	21 hours: 10 WTGs from May 1 to August 9 24 hours: for the remaining WTGs	329,800/100%
Alternative 2	33	No	21 hours: 5 WTGs from May 1 to August 9 24 hours: for the remaining WTGs	290,580/88%
Alternative 3	38	Yes	17 hours: April 1 to September 30 24 hours: for the rest of the year	284,468/86%

Under Alternative 1, Project O&M activities will be carried out by a facilities manager, four to six technical staff, and occasionally an office coordinator, with the facilities staffed during normal business hours. Routine maintenance of the WTGs will occur up to twice per year; each service typically takes between 1 and 3 days. Non-scheduled work may occur outside normal business hours and on weekends. This typically consists of responding to WTG stops, troubleshooting, repairing or changing out major component failure, retrofitting, or blade repair. Each WTG will be visited between 10 to 40 days per year; on rare occasions, a crane will be needed to complete more major component replacement.

Covered Activities include site management. The Project substation will normally be accessed monthly for basic visual inspection and sampling, with maintenance occurring annually. The transmission line will be inspected annually. Site roads will be maintained using normal gravel road maintenance equipment once or twice per year for the life of the facility. Regular site inspections for erosion and other environmental reasons will typically occur weekly. Site management work will implement HCP conservation measures associated with vehicle operations, trash management, and prescriptions for maintaining cleared spaces (see Section 2.3.2.1 for more detail).

Right-of-way maintenance timing and methods, as well as transmission line and road maintenance activities, do not vary among the alternatives. Potential impacts associated with these activities are addressed in Chapter 4.

2.3.2 Conservation Measures

Issuance of the ITP will also require implementation of the conservation strategy set forth in the HCP to offset the adverse effects on the Covered Species. The biological goals of an HCP are the guiding principles for the proposed conservation program and include minimizing take of the Covered Species in the Project Area, offsetting the impacts of taking the Covered Species associated with the Covered Activities, promoting a healthy bald and golden eagle population, reducing the threats of climate change on marbled murrelets, and promoting a sense of stewardship and awareness of biological resources among employees. The HCP identifies specific objectives to meet these goals, which include the minimization and mitigation measures summarized in the following sections.

2.3.2.1 Minimization Measures

To minimize the potential for effects on marbled murrelets, the following minimization measures would be implemented during WTG operations and site management activities:

- Select WTGs would be seasonally curtailed. During the first three years of operation, the maximum curtailment would occur from May 1 to August 9 at 10 WTGs located at the western and eastern ends of the Project for a period of 3 hours each morning (e.g., 4:30 a.m. to 7:30 a.m.). Potential modifications to the curtailment program after the first 3 years are described in greater detail in Sections 6.3 and 6.4 of the HCP. Modification to the curtailment program may be implemented as an adaptive management measure and would be based on monitoring data.
- Flight diverters would be maintained on all aboveground transmission and distribution lines to minimize collision risk according to Avian Power Line Interaction Committee suggested practices (APLIC 2012).
- Lighting will be directed downward and shielded, and Federal Aviation Administration (FAA)-required lighting on WTGs will be blinking, which has been shown to help minimize avian fatalities compared to non-blinking lighting (Gehring et al. 2009).
- Vehicle speed limits of 40 kilometers (25 miles) per hour would be enforced to minimize the potential for vehicle collisions with wildlife, including the Covered Species.
- Garbage disposal within the Project Area would be prohibited to minimize the potential for the artificial increase of potential nest predators. Additionally, the applicant will obtain a permit to remove bird carcasses from the Project Area, further minimizing the potential for nest predators to be attracted to the Project Area.

Many of the minimization measures for marbled murrelets will likely minimize risks to bald and golden eagles to some extent and vice versa. To further minimize the potential for effects on bald and golden eagles, the following minimization measures will be implemented (see Section 6.2.2 of the HCP for more detail):

- IdentiFlight[4] technology will be maintained and tested for up to 2 years to understand the curtailment parameters that will optimize IdentiFlight at the Project site. If testing shows that this technology is likely to be effective at curtailing turbines and saving eagles at the site, it will be implemented at the facility full-time and for the life of the project, as long as curtailment does not exceed 100 hours annually. If take rates appear to be on trajectory to exceed permitted take within the 2-year testing period, testing will be stopped and a conservative algorithm will be implemented to curtail turbines immediately. If this occurs, the curtailment ceiling will be raised to 200 hours. If a more effective collision avoidance strategy is demonstrated during this time period, then that may be utilized in lieu of IdentiFlight.
- Mammal carrion monitoring and removal near WTGs to minimize the risk of carrion attracting foraging bald or golden eagles to the Project site.

2.3.2.2 Mitigation Measures

To minimize the take associated with Alternative 1, the following actions would be implemented. These measures have been located to strategically protect or enhance habitat quality or stability for the targeted Covered Species, which may result in some marginal benefits to other Covered Species.

2.3.2.2.1 Conservation Lands

The Applicant proposes to purchase and manage two parcels as conservation lands for the benefit of marbled murrelets. These parcels, A and B, are in Pacific County and shown in Figure 2.3-1. The lands have been selected based on a regional assessment of conservation priorities, discussed in greater detail in Chapter 6 of the HCP.

[4] IdentiFlight refers to automated optical eagle-detection hardware/software package, which is discussed further in Chapters 3 and 5 of the HCP.

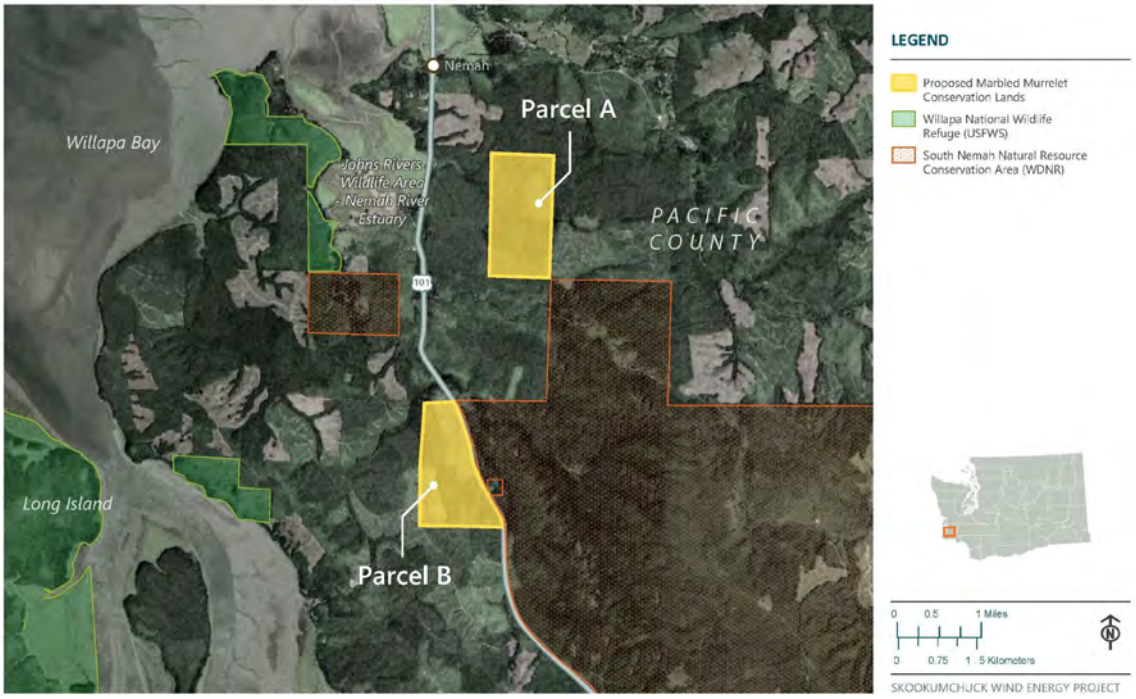

Figure 2.3-1. Proposed Conservation Lands Map

Two parcels of private timber lands consisting of approximately 300 acres each (620 acres in total) would be removed from active timber production prior to commencement of Project O&M to be held in perpetual permanent conservation for the benefit of marbled murrelets and bald eagles. The Applicant would purchase the conservation lands and convey the title to the lands to a nonprofit conservation entity, including restrictions in the deed that obligate the conservation entity to maintain and manage the lands for conservation purposes in perpetuity. More details on the mechanism for acquiring and maintaining these parcels can be found in Section 6.1.3 of the HCP.

About half of each parcel (311 acres in total) currently contain areas with suitable marbled murrelet nesting habitat, consisting of naturally regenerated western hemlock (*Tsuga heterophylla*) stands that are 60 to 75 years old. These stands contain scattered groups of remnant old trees with suitable nesting platforms for marbled murrelets. Currently, these older stands are at risk of future timber harvest, because only 21 acres out of the 311 acres of mature stands over 60 years old are classified as "occupied" marbled murrelet habitat that would be protected under existing regulations. The remaining areas in the parcels (309 acres) consist of young trees ranging in age from 5 to 46 years old. With conservation, these young stands are expected to grow and mature over the next 30 years and will function as protective buffers to the higher-quality nesting stands, shielding them from windthrow, maintaining appropriate microclimate conditions, and maintaining a reduced density of nest predators as compared with unbuffered stands.

Eagles will also receive marginal benefit from these lands as they will provide nesting habitat, roosting snags as trees mature and die, and foraging habitat near water. The mature forested lands will also provide a more open canopy that will provide foraging habitat. These habitats will be protected as part of the agreement, providing stable habitat into the future.

A draft management plan for the conservation sites is incorporated by reference in the HCP. Some enhancement activities, such as thinning and interplanting, may also be implemented to ensure the proposed lands reach a level of quality nesting habitat sufficiently high to offset the anticipated take associated with WTG operation and site management. If the ITP is issued prior to implementation of the Covered Activities, the landowner would finalize the management plan with the Service's approval to implement the HCP conservation program on the conservation site. The landowner may propose management plan revisions (subject to Service approval) without modifying the HCP, provided the revisions do not change the biological goals, anticipated outcomes, or amount or extent of take associated with the Permit. However, the permittee will remain responsible for assuring full implementation of the HCP, including the management plan. For the purposes of this analysis, it is assumed that initial enhancement activities, such as thinning and interplanting, would occur in the areas where suitable habitat does not currently exist and that periodic maintenance and monitoring activities would occur at established intervals over the ITP's term. Monitoring is described in more detail in Section 2.3.3.

If thinning is deemed necessary, these activities may require the use of specialized machinery (similar to a small bulldozer) to selectively remove trees. Typically, thinning for enhancing old-growth development involves removing smaller trees to leave larger ones in place. Enhancement activities would be determined in coordination with the Service and completed in a manner to minimize potentially adverse environmental impacts. For example, work within or immediately adjacent to waterways would be limited to the extent possible. If interplanting is deemed necessary, site preparation may require the use of mechanical equipment or chemical treatments, and depending on the site conditions, planting methods could range from hand-planting to using specialized small machinery for planting.

2.3.2.2.2 Derelict Fishing Net Removal

Prior to commencement of Project activities, the Applicant would fund the ongoing removal of derelict fishing nets to minimize the risk of entanglement and incidental mortality of marbled murrelets in the Salish Sea. The Applicant proposes to enter into an agreement with an existing conservation organization that currently performs derelict fishing net removal to fund identification and removal of sufficient nets to prevent the entanglement of 53 marbled murrelets. A third-party conservation organization would be responsible for the implementation and environmental compliance of this activity. Using a model developed by the Service (Service 2017a), updated with recent marbled murrelet marine population densities, the Applicant estimates that this objective

will be met by the removal of between 91 and 96 abandoned net pieces over the first 6 years of the permit term. More information is provided in Chapter 6 of the HCP.

2.3.2.2.3 Eagle Power Pole Retrofit Program

Eagle mitigation would consist of implementing a program for power pole retrofits to minimize the risk of electrocution by retrofitting, reframing, or rebuilding power poles that present a high risk to golden eagles. While this mitigation measure will be targeting golden eagles (poles will be selected for their risk to golden eagles), bald eagles would also benefit from the power pole retrofit program, although likely to a lesser extent. Consistent with the Service's *Eagle Conservation Plan Guidance* (ECPG; Service 2013), the Applicant will fund the retrofit of poles to offset take at a ratio of 1.2 to 1, provided in 5-year increments.

The Service Resource Equivalency Analysis (REA) provided in Appendix G of the ECPG was used to determine the number of power pole retrofits that needed to be completed to offset the predicted golden eagle take for the first 5 years. The following two types of mitigation programs are currently available to mitigate golden eagle take: 1) a permittee-responsible mitigation approach where the applicant works directly with a utility in coordination with the Service to retrofit power poles; and 2) an in-lieu fee program, which is a type of mitigation banking approach where funding is directed at the discretion of the service provider in coordination with the Service. Using the REA, each mitigation program results in varying numbers of poles needed for retrofit because of the underlying assumptions used in the calculations (e.g., the year when retrofits would occur and longevity of the retrofit [10-year duration or 30-year duration]). Completing power pole retrofits at 1.2 times the amount of mortality resulting from project operations would promote a healthy bald and golden eagle population in the Local Area Population (LAP) to meet the Service's preservation standards.

"Retrofitting" for the purposes of this mitigation requirement means to make a presently high-risk pole into a relatively safe pole (i.e., lower the risk of electrocution) for golden eagles. The Avian Powerline Interaction Committee has produced a *Suggested Practices for Avian Protection on Power Lines* document that outlines how retrofits may be accomplished (APLIC 2006). This document outlines a range of actions that could be performed to accomplish a successful retrofit, including physically increasing clearances (separation) between energized/grounded components (i.e., reconfiguring or reframing poles) or adding insulation over energized/grounded components to minimize the risk of electrocution. These modifications typically involve the use of a utility truck to hoist and set the poles, replace cross arms, restring wires, add covers, or transport utility crews to work at the pole tops. Depending on the extent of the modifications, up to two trucks may be required, with activities lasting from a couple of hours to a few days.

2.3.3 Monitoring

The Applicant would conduct a monitoring program as part of the HCP to verify ITP compliance, including the evaluation of the level of take of the Covered Species; provide progress reports on the fulfillment of mitigation requirements; and enable evaluation of the effectiveness of the minimization and mitigation measures in meeting the biological goals and objectives of the HCP. The Service must approve the monitoring program in writing. The program will ensure that take is not exceeded and the objectives of the HCP are met.

2.3.3.1 Compliance Monitoring

Compliance monitoring would consist of mortality monitoring conducted in three phases: Evaluation, Implementation, and Re-Evaluation. Fatality monitoring methods and analysis are described in detail in the Post-Construction Monitoring Plan (WEST 2018, Appendix G of the HCP). The compliance monitoring program will be re-evaluated by the Service and Applicant over the course of the ITP to ensure that best available methods are used.

During the Evaluation Phase, 100% of the WTGs would be searched weekly from April 1 to August 31 and every two weeks from September 1 to March 30 each year during Years 1, 2, and 3 of Project O&M. Radar monitoring would supplement mortality searches from July 1 to August 9 of Year 1 from 105 minutes before sunrise to 75 minutes after sunrise.

During the Implementation Phase, if adaptive management measures are not triggered, a stepped-down approach to monitoring would be adopted at a level sufficient to ensure the Applicant is in compliance with the ITP. This phase will remain in effect for the duration of the operational life of the Project unless an adaptive management trigger is reached. Triggers for adaptive management are summarized in the following sections and described in Chapter 6 of the HCP.

The Re-Evaluation Phase would occur if an adaptive management trigger is met and operational changes are needed as described in the following sections and in greater detail in Section 6.4 of the HCP.

2.3.3.2 Effectiveness Monitoring

Effectiveness monitoring is required to ensure that the mitigation described in Section 2.3.2.3 is effective and remains in compliance with the terms and conditions of the ITP. Effectiveness monitoring of the marbled murrelet and bald eagle conservation lands would include, at minimum, an annual assessment to verify the parcel is intact and available to murrelets for nesting. Specific measures for the marbled murrelet mitigation monitoring program would be proposed by the conservation land manager. The conservation entity will design the mitigation monitoring program in cooperation with federal partners, including the Service, prior to the commencement of Project O&M. The Service must approve the monitoring program in writing. The program will ensure that take is not exceeded and the objectives of the HCP are met.

An initial monitoring effort will be conducted by qualified utility staff in the year following retrofit implementation (i.e., the second year of Covered Activities) at 100% of the mitigation poles. Identified mitigation pole locations will be documented with before and after photographs for each mitigation retrofit location to document the work that is completed at each location. The retrofit work and documentation will be reviewed by a utility quality control assessor for approval within 30 days of work. These results will be compiled in an after-action report that will be provided to the Service within 60 days of completion of the mitigation retrofit effort. Every 5 years. long-term effectiveness monitoring of the retrofits will be conducted by qualified utility staff at 100% of the mitigation poles in accordance with the Service's *Programmatic EIS for the Eagle Rule Revision* (Service 2016b) and at the expense of the Applicant as necessary. Post-retrofit monitoring for target pole modifications completed as part of the compensatory eagle mitigation program achieves the following three objectives: 1) check on device and material installation (i.e., was it done correctly, or are there signs of operational issues?); 2) determine device and material longevity (i.e., exposure to environmental conditions); and 3) assess the efficacy of the installation (i.e., are there signs of subsequent bird mortality?). The results of the monitoring efforts will be included in the annual reports described in Section 6.5 of the HCP.

2.3.4 Adaptive Management

The adaptive management framework for marbled murrelets and for bald and golden eagles will involve reviews every 5 years, in keeping with the requirement of the Service's *Programmatic EIS for the Eagle Rule Revision* (Service 2016b). This provides for consistent timing in conducting the evaluation of observed take against the permitted limits for both species. The estimated number of fatalities, derived from information gathered during compliance monitoring, will be used to evaluate the number of individuals taken over the life of the project and the annual rate of take against the permitted take limit. Both adaptive management frameworks consist of a stepwise approach, identifying specific thresholds that trigger the need for implementation of the specified adaptive management measure. Thresholds/triggers are presented as a progression of observed or estimated fatalities over time that would indicate a high enough rate of take to exceed the permitted limit before the end of the permit term. Each threshold, if reached, signals a concerning level of estimated mortality and requires additional measures to increase monitoring or minimization of take. The specific thresholds and adaptive management strategies required at each tier are presented in Tables 30 and 31 of the HCP for marbled murrelets and eagles, respectively.

2.4 Alternative 2 – Modified Project Site Design

Under Alternative 2, the Modified Project Site Design Alternative, the Service would issue an ITP authorizing a lower level of take than what is requested by the Applicant. If Project construction had not already occurred, issuance of the ITP would likely result in the activities described in Section 5.1. Under this alternative, the Project operational design would be modified

such that the five WTGs closest to documented marbled murrelet nest locations (T34 through T38) would not operate at all for the duration of the ITP. These five WTGs had the highest marbled murrelet detection frequencies during pre-construction surveys. Operational parameters for the balance of the Project are assumed to be implemented as described in Alternative 1. Under these conditions, Alternative 2 operations would result in a reduction of energy production to about 88% of the energy that could be generated by Alternative 1 (Table 2.3-1). Take rates for covered species would be reduced to about 89% of the estimated take for Alternative 1 for marbled murrelet[5] and 87% for both bald and golden eagle. O&M activities related to the five WTGs would not occur, which would also represent a very slight reduction in the level of activity required under Alternative 2 compared to Alternative 1.

Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. The amount of conservation land would likely remain the same because it is not functionally practical to obtain less land; however, the number of derelict nets removed would be fewer. With respect to bald and golden eagles, approximately 88% as many power poles would be retrofitted to offset lower levels of take. The monitoring and adaptive management measures would be the same as those described in Sections 2.3.3 and 2.3.4, respectively.

2.5 Alternative 3 – Enhanced Curtailment

Under Alternative 3, the Enhanced Curtailment Alternative, the Service would issue an ITP authorizing a lower level of take than what is requested by the Applicant. If Project construction had not already occurred, issuance of the ITP would likely result in the activities described in Section 5.1. Under this alternative, Project O&M would be further curtailed to minimize the potential for take of the Covered Species. Under these conditions, Alternative 3 operations would result in a reduction of energy production to about 86% of what would occur under Alternative 1. This would result in about 58% of the estimated take for Alternative 1 for marbled murrelet and 85% and 92% for bald and golden eagles, respectively. Although energy production levels would be lowest for this alternative, it is expected that O&M activities would generally be the same as for Alternative 1. The same type and level of activities would likely be required to operate and maintain all the WTGs.

Under Alternative 3, Project operating conditions would be modified such that turbine rotation would be curtailed each year from April 1 to September 30 (corresponding to reported marbled murrelet breeding season in Western Washington [Hamer and Nelson 1995; Huff et al. 2006;

[5] Note that the reduction in take for marbled murrelets may be greater than modeling results suggest because the five non-operational WTGs are expected to have consistently high passage rates given past data and their proximity to nesting habitat, and this was not fully incorporated in the model.

Service 2012a]) to minimize the probability of incidental take. This measure extends the period during which WTG curtailment would be employed and is intended to minimize the probability of strikes during the time when marbled murrelets are most likely to be moving through the Project Area—up to several times each day.

Under Alternative 3, the enhanced curtailment would be applied to all 38 WTGs during dawn and dusk periods, corresponding with reported periods of increased flight activity to and from inland nests during the breeding season (Hamer and Nelson 1995). The daily curtailment period would begin 2 hours before sunrise and end 2 hours after sunrise, and the dusk curtailment period would begin 2 hours before sunset and end 1 hour after sunset.

In addition, Alternative 3 would include enhanced curtailment for bald and golden eagles, consisting of the installation and use of technology (i.e., IdentiFlight equipment) that identifies eagles approaching the Project site and halts blade rotation within calculated flight paths to minimize strikes. Under this alternative, this equipment would be in place and fully functional when Project O&M begin and would continue to operate throughout the duration of the 30-year ITP.

Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. With respect to bald and golden eagles, slightly fewer power poles than Alternative 2 would be retrofitted to offset lower levels of take. The monitoring and adaptive management measures would be the same as those described in Sections 2.3.3 and 2.3.4, respectively.

2.6 Alternatives Considered but Eliminated from Detailed Study

2.6.1 Alternate Project Siting Locations

Under this alternative, alternate locations where the Project could be sited would be evaluated. The proposed Project sequence does not afford the Service a process to condition turbine siting through permit issuance at macro or micro scales. Therefore, alternate locations could be considered in this EIS, but this may not inform the Action Alternatives. Consequently, siting alternatives were considered but eliminated from detailed study. The Service has analyzed a reasonable range of Action Alternatives related to O&M at this site, which covers a full spectrum of alternatives in the EIS.

2.6.2 Project Operation and Maintenance Without Incidental Take Coverage

Under this alternative, the Applicant could elect to operate the Project without an ITP and accept the liability for any potential take of the Covered Species that may occur. However, because of the high likelihood for take during the 30-year period, this alternative would likely be in conflict with the ESA and the BGEPA and would be considered unlawful in the absence of an ITP and

the required compensatory mitigation that the ITP would afford. Therefore, this alternative was not carried forward as a baseline for comparison or as the No Action Alternative.

2.6.3 Emerging Technologies Alternative

Several emerging technologies have the potential to further minimize the probability of take as a reasonable operational alternative or as a component of a curtailment and minimization strategy. However, at the time of publication, there are insufficient data on the effects of these evolving measures pertinent to the Covered Species (or suitable surrogates) or Project O&M to allow for a thorough analysis of these options. For these reasons, this alternative is not evaluated further.

3 Affected Environment

3.1 Introduction

3.1.1 Study Area

This section describes existing conditions near the proposed Project facilities, called the "Project Area" (Figure 2.1-1), and in other areas that could be affected by the Proposed Action, namely the "Mitigation Areas," including the conservation lands and eagle power pole retrofit program (Figure 2.3-1).[6] Collectively, the Project Area and Mitigation Areas are called the "Action Area" (Figure 1.1-1). The Action Area represents the area that would be covered by the ITP. Unless otherwise noted, the Action Area is the study area for potential effects of the Proposed Action.

The Project Area covers approximately 22,000 acres located mainly in Lewis County, Washington, with a small portion of the proposed facilities, specifically the O&M facility, located in Thurston County. Of this, 20,000 acres are located on privately owned lands and 2,000 acres are located on public lands. About 1,455 acres are leased to the Applicant for the Project, with the rest (20,545 acres) of the Project Area mostly in active timberland.

The remainder of the Action Area includes the Mitigation Areas. The proposed conservation lands are in Pacific County (Figure 2.3-1). They cover approximately 620 acres of forested areas, currently in private ownership and managed for timber production. Derelict fishing net removal to benefit marbled murrelets would occur in the Salish Sea, and the eagle power pole retrofit program is proposed to occur within the same region and EMU as the Project, which includes parts of the Pacific Flyway EMU.

3.2 Geology and Soils

This section describes geologic and soil conditions and resources within the study area. The terrain within the Project Area is a series of ridgelines that range in elevation from approximately

[6] Additional mitigation in the form of derelict net removal entails the Applicant paying into a fund to support ongoing activities already occurring in the Salish Sea. While these activities would benefit the Covered Species, they would not represent a substantive change over the activities already occurring in that area.

450 meters (1,476 feet) to 1,050 meters (3,445 feet) above mean sea level and are separated by lower-elevation stream-lined valleys. A review of geologic maps of the Project Area indicate that the area is underlain by upper Eocene volcanic rocks and marine sedimentary rocks, as well as Quaternary alluvium, glacial deposits, and mass-wasting deposits (DNR 2017). Soils in the Project Area consist mostly of loams but also range from rock outcrops to mucks of varying texture; given the mountainous setting and varied terrain within and around the Project Area, the presence of steep slopes and erosion hazards is expected (NRCS web soil survey and Soil Survey Geographic Database data, USDA 2017). There is also one known fault within the Project Area and five located 1.6 to 3.2 kilometers (1 to 2 miles) south of the proposed transmission line (PNSN 2017a). Since 1974, there have been 47 recorded earthquakes within 6.4 kilometers (4 miles) of the Project Area (PNSN 2017b).

The conservation lands would be located just inland from the Washington Coast in an area marked with sloping terrain and consisting mainly of forested land bisected by various unnamed tributaries. The same region and EMU as the Project consists of a diverse mix of topography and soils with PacifiCorp power lines located in a range of conditions (e.g., along roadways, in developed areas, and in rural areas).

3.3 Air Quality

This section describes the air quality conditions within the study area in terms of the attainment status for criteria pollutants relative to national and state thresholds and existing sources of air pollution. Air quality is regulated by the Olympic Region Clean Air Agency in Pacific and Thurston counties and by the Southwest Clean Air Agency in Lewis County.

Local air quality measurement data indicate that Lewis, Thurston, and Pacific counties meet national and state air quality standards and are currently designated as “in attainment” for all criteria pollutants (Ecology 2018). Existing sources of localized air emissions near the proposed Project facilities and in the conservation lands mainly come from the operation of mobile equipment used in commercial forestry activities. Other sources of emissions come from surrounding residential and agricultural lands uses, including from vehicle and equipment operations and agricultural activities. Localized sources of emissions within the same region and EMU as the Project come from a diverse mix of stationary and mobile sources, with emissions typically more concentrated in the more urbanized areas.

3.4 Water Resources

The Project Area spans two Water Resources Inventory Areas (WRIAs): 13, Deschutes and 23, Upper Chehalis (Ecology 2017), with the majority of the Project Area located within Hydrologic Unit Codes 17110016 Deschutes and 17100103 Upper Chehalis. The main surface waters include the Deschutes, Newaukum, and Skookumchuck rivers, but there are also several other smaller creeks and unnamed tributaries (Figure 2.1-1). Due to the varied topography and

ridges present, surface waters are generally located at lower elevations. No lakes exist within the Project Area.

The northern portion of the Project Area (where the O&M facility is located) is also within the boundary of the Puget Sound aquifer system, which occurs in unconsolidated glacial deposits. This is a major regional aquifer system that supplies many wells, although no public water supply sources are located within the Project Area. The only portion of the proposed Project facilities within a floodplain is located along Vail Cut Off Road adjacent to the Deschutes River, which provides access to the O&M facility.

The conservation lands are located in WRIA 24, Willapa, which includes the Nemah and Naselle rivers that flow into Willapa Bay. There are also several small tributaries and tidal marshes in the vicinity, with unnamed streams flowing within the conservation lands. Within the area targeted for the eagle power pole retrofit program, water resources include a multitude of lakes, rivers, streams, and reservoirs across multiple states. Power distribution infrastructure is generally located in upland areas away from major surface water resources.

3.5 Vegetation and Wetlands

This section describes vegetation and wetlands within the study area, focusing on dominant land cover classes. Special-status plants are addressed in Section 3.7.

The study area is within the Cascades Ecological Region (Tier III ecoregion), which extends from the central portion of western Washington to the south through the Cascade Range of Oregon and includes a disjunct area around Mt. Shasta in northern California (USEPA 2013).

Vegetation within the ecoregion is characterized by highly productive coniferous forests dominated primarily with an overstory of Douglas fir (*Pseudotsuga menziesii*), western hemlock, western red cedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*), and red alder (*Alnus rubra*) at lower elevations. A large portion is federal land managed by the U.S. Forest Service and the U.S. Bureau of Land Management, with most of the remainder held in private ownership. Much of the forested lands within this ecoregion, such as the Project Area and the conservation lands, are maintained as managed forest for timber. Managed forests, development, and agriculture have substantially changed the historic vegetation in this ecoregion.

3.5.1 Project Area

The majority of the Project Area is located on private commercial forestry lands owned and managed by Weyerhaeuser Company. There are three dominant land cover classes in the Project Area, accounting for more than 85% of the area: Evergreen Forest (35.7%), Shrub/Scrub (26.9%), and Developed/Open Space (20.4%) (ABR, Inc. 2011). These three land cover classes are described in the following text. The remaining land cover classes include Barren Land (8.5%),

Wetlands (3.0%), Grassland/Herbaceous (2.7%), Mixed Forest (1.4%), Pasture/Hay and Cultivated Crops (0.8%), Deciduous Forest (0.6%), and Open Water (0.1%) and are only briefly described.

The largest land cover class in the Project Area, Evergreen Forest, is relatively uniformly spread throughout and includes tree species common to managed forests, such as Douglas fir, western hemlock, and western red cedar. All commercial timber lands within the Project Area have been cut at least once, and several areas are on their third or fourth rotation. Commercial timber harvest in the Project Area has prevented development of old-growth forest characteristics.

The second-most common cover class is Shrub/Scrub and is found in areas where logging has more recently occurred, including some areas near the proposed Project facilities. These areas are characterized by young stands of planted Douglas fir regrowth, naturally colonizing red alder saplings, and shrub and undergrowth species such as red huckleberry (*Vaccinium parvifolium*), salal (*Gaultheria shallon*), and various grasses.

Developed/Open Space is the third-largest land cover class within the Project Area and is composed of roadways and other structures and buildings. These areas are scattered throughout and are unvegetated.

Vegetation associated with the remaining forested land cover classes found within the Project Area includes very small areas of black cottonwood (*Populus trichocarpa*), quaking aspen (*Populus tremuloides*), and paper birch (*Betula papyrifera*) (Parks et al. 1997). Understory species in these areas are dominated by red huckleberry and other deciduous shrubs.

Small areas of farmland (Pasture/Hay and Cultivated Crops land cover classes) are located mainly in the northern part of the Project Area near the O&M facility and towards the east near the transmission line. These areas include native perennial grasses, perennial legumes, and non-native grasses. Perennial grasses typically include bentgrasses (*Agrostis* spp.), Kentucky bluegrass (*Poa pratensis*), and reed canarygrass (*Phalaris arundinacea*), while perennial legumes include alfalfa (*Medicago sativa*) and alsike clover (*Trifolium hybridum*) (Fransen and Chaney 2002).

Wetlands were identified by National Land Cover Database classifications and include palustrine emergent, palustrine forested, palustrine scrub-shrub, riverine, and freshwater ponds. As shown in Figure 2.1-1, wetlands occur throughout the Project Area and are generally associated with streams and rivers at the lower-lying elevations. The dominant herbaceous species observed in the emergent wetlands is reed canarygrass, while red alder, Devil's club (*Oplopanax horridus*), and salmonberry (*Rubus spectabilis*) dominate the forested and scrub-shrub wetlands. Per Thurston County and Lewis County regulations, riparian vegetation buffers associated with wetlands, streams, and rivers are protected during timber harvest on private forestland.

3.5.2 Mitigation Areas

The two parcels of conservation lands consist of mixed-conifer stands dominated by western hemlock with a minor component of Douglas fir and Sitka spruce (*Picea sitchensis*). Over half (174 acres) of Parcel A is composed of stands 60 to 75 years old, which contain legacy trees that were retained through previous harvest cycles. There is a high incidence of hemlock dwarf mistletoe (*Arceuthobium tsugense*) and other decadent features (e.g., limb deformities and candelabras) in the canopy. Parcel B is approximately 289 acres, of which 156 acres are stands that are approximately 70 years old. These stands were classified as suitable murrelet nesting habitat based on field surveys and timber cruise inventory data. Because of recent timber harvest within the parcel, the distribution of stand ages is either late-seral stands, mature stands, or younger stands less than 26 years old.

The area targeted for the eagle power pole retrofit program consists of a diverse mix of land cover classes, with PacifiCorp power lines located in a range of conditions (e.g., along roadways, in developed areas, and in rural areas) and associated vegetation. In all cases, PacifiCorp maintains the right-of-way and associated vegetation to maintain clearance of the lines and ensure there are no safety conflicts.

3.6 Fish and Wildlife

This section describes the fish and wildlife species groups that are likely to occur in the Project Area and near the conservation lands. These areas are within the Cascades Ecological Region (Tier III ecoregion), extending from the central portion of western Washington to the south through the Cascade Range of Oregon, and include a disjunct area around Mt. Shasta in northern California (USEPA 2013). Special-status species are addressed in greater detail in Section 3.7.

3.6.1 Fish

Within the Project Area, there are several fish-bearing streams and rivers, the largest of which include the Deschutes, Newaukum, and Skookumchuck rivers (Figure 2.1-1.) These and other creeks and unnamed tributaries within the vicinity of the Project Area support anadromous fish (WDFW 2016), including resident and coastal cutthroat (*Oncorhynchus clarkii*), steelhead and rainbow trout (*Oncorhynchus mykiss*), and coho salmon (*Oncorhynchus kisutch*) (WDFW 2018a).

The conservation lands also include several unnamed drainages with habitat supporting anadromous fish: the largest drainage running east-west through Parcel A supports coho salmon, winter steelhead, and fall chum (*Oncorhynchus keta),* while the largest drainage running north-south through Parcel B supports both resident and coastal cutthroat. Several smaller drainages exist within each parcel; however, the presence of fish in these tributaries is unknown (WDFW 2018a).

Although portions of PacifiCorp's power transmission infrastructure may be located near waterways, the transmission lines are generally in upland areas away from fish and aquatic habitat.

3.6.2 Birds

The study area is located in the Pacific Flyway, one of the area's main north-south migratory routes used by a variety of bird species. The Pacific Flyway extends from the arctic regions of Alaska and Canada to South America and is bounded on the west by the Pacific Ocean. Many neotropical migrant birds and raptor species use the Pacific Flyway to migrate between breeding habitat in North America and wintering habitat in the tropics. The proposed Project facilities are located about 41.8 kilometers (26 miles) from the Puget Sound at Olympia, where numerous shorebirds and waterfowl stop over during migration and winter (Page et al. 1999).

In addition to being located within this migration corridor, the Project Area provides a range of features that support breeding, foraging, resting, and overwintering habitat for a wide variety of resident bird species (Johnson and O'Neil 2001). General avian surveys performed during the winter, spring, and summer survey periods in 2014 and 2015 (ABR, Inc. 2015a) identified a total of 68 different species.

Table 3.6-1 provides the results of the general avian surveys by species group for each of the survey periods. Detailed results are presented in Appendix C of the HCP (ABR, Inc. 2015a). Notable bird species observed during these surveys include bald eagle (federal species of concern, state sensitive species); peregrine falcon (*Falco peregrinus*; federal species of concern, state sensitive species); pileated woodpecker (*Dryocopus pileatus*; state candidate species); and Vaux's swift (*Chaetura vauxi*; state candidate species). Two additional avian studies were conducted in the Project Area, the results of which are discussed in greater detail in Section 3.7: a large avian use study was conducted between January 2016 and March 2017 for species larger than the size of an American crow (*Corvus brachyrhynchos*), and a radar and visual study of marbled murrelets was conducted during the summer breeding periods in 2013 and 2014.

Table 3.6-1. Results of Avian Surveys in the Project Area

Species Group	Number of Species	Individual Counts				Totals
		Winter 2014	Spring 2015	Summer 2015	Fall 2015	
Raptors	11	12	49	44	52	157
Passerines	45	208	958	660	1142	2,968
Game Birds	1	1	14	2	3	20
Waterbirds	1	0	3	0	32	35
Woodpeckers	5	18	61	10	43	132
Other	5	2	68	48	15	133
Totals	**68**	**241**	**1,153**	**764**	**1,287**	**3,445**

The Service also identifies species of migratory birds as "Birds of Conservation Concern" that, without additional conservation actions, are likely to become candidates for federal listing (Service 2008). Birds of Conservation Concern observed in the Project Area during the avian studies include the rufous hummingbird (*Selasphorus rufus*), the olive-sided flycatcher (*Contopus cooperi*), and the willow flycatcher (*Empidonax traillii*).

Forested areas of the Project Area provide foraging and nesting habitat for a wide variety of common passerine species identified in relative abundance during the avian surveys, such as song sparrow (*Melospiza melodia*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), Steller's jay (*Cyanocitta stelleri*), spotted towhee (*Pipilo erythrophthalmus*), Swainson's thrush (*Catharus ustulatus*), Pacific wren (*Troglodytes pacificus*), varied thrush (*Ixoreus naevius*), dark-eyed junco (*Junco hyemalis*), chestnut-backed chickadee (*Parus rufescens*), and red-breasted nuthatch (*Sitta canadensis*) (ABR, Inc. 2015a).

Upland clear-cut and herbaceous and grassland areas are also likely used by species identified in the avian surveys, such as barn swallow (*Hirundo rustica*), tree swallow (*Tachycineta bicolor*), and white-crowned sparrow (*Zonotrichia leucophrys*). Predatory birds, such as red-tailed hawks (*Buteo jamaicensis*) and northern harriers (*Circus cyaneus*), commonly hunt in these habitat types. Other raptors, such as bald eagles and ospreys (*Pandion haliaetus),* occur in forested areas near bodies of water. Snags and downed trees in logged habitat and along the forest edges also provide perch sites for bald eagles and ospreys.

Snags in forested habitats, while limited in managed forests, also provide potential nest sites for cavity-nesting birds, such as great horned owl (*Bubo virginianus*), and species of woodpeckers including downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), and pileated woodpecker. Disturbance-tolerant bird species such as American crow and American robin (*Turdus migratorius*), have been observed within the Project Area (ABR, Inc. 2015a).

Due the similarities in habitat, including forested areas and recently clear-cut Shrub/Scrub areas, similar types of bird species as those found in the Project Area are also expected to occur within the conservation lands. Bird species within the area targeted for the eagle power pole retrofit program also include a similar range of species, with disturbance-tolerant species being more common in the developed areas. Due to area being located within the Pacific Flyway, the presence of migratory birds (such as bald and golden eagles) likely also occurs.

3.6.3 Bats

The potential for bats to occur in the Project Area is based on the availability of foraging areas with prey insects, roost trees, and water sources (WDFW 2013a). The second-generation and younger forests that predominate the Project Area provide less extensive bat roosting habitat but may offer suitable commuting or foraging opportunities. However, nearly all bat species found in

Washington occasionally roost in crevices found in rock fractures or talus slopes (WDFW 2013a). Given the occasional rock outcropping in the Project Area, some crevice roosting habitat may be present. Riparian vegetation in the Project Area potentially provides roosting and foraging habitat for both resident and migrating bats. Riparian buffer strips in the Project Area also provide some of the largest roost trees for bats. The Chehalis River and its tributaries are a potential water source for bats, as well as a landscape feature that may serve as a flyway. Although bats tend to follow linear landscape features (such as riparian areas) when commuting between roosting and foraging areas, little is known about their actual flyways, particularly during migration.

In order to provide baseline information on bat migration, an acoustic study of bat activity was conducted for the Project in 2015 (ABR, Inc. 2016). This study collected baseline information on levels of bat activity for migratory bats (e.g., hoary [*Lasiurus cinereus*], big brown [*Eptesicus fuscus*], and silver-haired [*Lasionycteris noctivagans*] bats); and non-migratory species (e.g., *Myotis* spp.).

Overall, bat activity within the Project Area was found to be relatively high. The following species were identified during the surveys, in descending order of observed numbers: silver-haired, hoary, big brown, little brown (*Myotis lucifugus*), California (*Myotis californicus*), western long-eared (*Myotis evotis*), Yuma (*Myotis yumanensis*), fringed (*Myotis thysanodes*), long-legged (*Myotis volans*), and Townsend's big-eared (*Corynorhinus townsendii;* state candidate species) bats. The silver-haired and hoary bats accounted for most of the bats surveyed (ABR, Inc. 2016). Townsend's big-eared bat is a state candidate species and is addressed further in Section 3.7 (WDFW 2018b).

The composition of bat species found in the conservation lands is expected to be similar to the species found in the Project Area, based on similar habitat and the availability of foraging areas, roost trees, and water resources. Additionally, bat presence is expected in the area targeted for the eagle power pole retrofit program, where more developed areas provide suitable foraging habitat.

3.6.4 Mammals

Several species of large and medium-sized mammals frequently found in forested and/or cleared habitats in Washington are likely to occur in the Project Area, including mountain lion (*Puma concolor*), bobcat (*Felis rufus*), black-tailed deer (*Odocoileus hemionus columbianus*), black bear (*Ursus americanus*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*). Smaller mammalian species include a variety of mice, shrews, and tree and flying squirrels (WDFW 2018b).

The Project Area is also located within the winter range for the South Rainier herd of Roosevelt elk (*Cervus elaphus roosevelti*), a hunted game species in Washington (WDFW 2018a). Ideal elk habitat includes productive grasslands, meadows, or clear-cut interspersed with closed-canopy forests. Year-

round ranges for Roosevelt elk are usually 1,500 to 4,000 acres and are generally found where food and cover are readily available. The current population of the South Rainier Roosevelt elk herd is estimated to be 1,700 animals, and the population range objective is 2,500 animals in Washington (WDFW 2002). The limiting factors for the South Rainier Roosevelt elk population are thought to be loss of habitat and direct mortality resulting from both legal and illegal hunting. State conservation plans specifically seek to maintain the current amount of elk winter range along the Cowlitz and Skookumchuck rivers and the Hanaford Creek area. Elk wintering habitat is also considered a locally important habitat area by Lewis and Thurston counties.

The conservation lands are located within the range of the Willapa Hills herd of Roosevelt elk in areas considered to have some of the highest densities of this elk population (WDFW 2014). Being a similar forested habitat, similar predator and small mammal species are expected to occur within the conservation lands as those that occur in the Project Area. Considering the wide range of habitats in the area targeted for the eagle power pole retrofit program, elk, predators, and other small mammals are expected to occur with varying abundances within these areas.

3.6.5 Reptiles and Amphibians

Wetlands and riparian areas provide habitat for a variety of both still-water amphibians, such as the northern red-legged frog (*Rana aurora*), Pacific treefrog (*Pseudacris regilla*), and rough-skinned newt (*Taricha granulosa*), and terrestrial amphibians found in riparian areas, such as western red-backed salamander (*Plethodon vehiculum*).

Several species of amphibians have been documented in stream surveys adjacent to the Project Area (WDFW 2018a), such as the Cascade torrent salamander (*Rhyacotriton cascadae;* state candidate species), Cope's giant salamander (*Dicamptodon copei*), Columbia torrent salamander (*Rhyacotriton kezeri*), Van Dyke's salamander (*Plethodon vandykei;* state candidate species), Dunn's salamander (*Plethodon dunni;* state candidate species), tailed frog (*Ascaphus truei*), and the Western toad (*Anaxyrus boreas;* state candidate species).

Reptiles such as the common garter snake (*Thamnophis sirtalis*) and western terrestrial garter snake (*Thamnophis elegans*) are likely to occur in the upland habitats of the Project Area. Upland habitats with rocks and wood debris support species such as northern alligator lizard (*Gerrhonotus coeruleus*) and northern garter snake (*Thamnophis ordinoides*).

The conservation lands contain wetland and riparian areas associated with streams. These areas are expected to provide habitat for amphibians, while upland forested areas likely support reptiles. Species composition within these conservation lands are expected to be similar to species found in the Project Area. Similarly, where the area targeted for the eagle power pole retrofit program crosses appropriate habitat, reptiles and amphibians are expected to occur, though the distribution lines are generally in upland areas away from aquatic habitat.

3.7 Rare, Threatened, and Endangered Species

This section addresses rare, threatened, and endangered plant and animal species that have been observed or that have the potential to occur within the broader region surrounding the Project and Mitigation Areas. This includes species that are federally listed as threatened or endangered, proposed for federal listing, or are federal candidate species; are state species of concern (defined as state-listed as threatened, endangered, sensitive, or candidate); or that receive specific protection defined in federal or state legislation.

Information in this section comes from special-status species lists for Thurston, Lewis, and Pacific counties (Service 2018a, 2018b, 2018c; WDFW 2018a; ODFW 2018) and Project surveys. Site-specific surveys were conducted in and around the Project Area from 2015 to determine the presence of different wildlife species, including special-status species, and their habitats (ABR, Inc. 2011, 2015a, 2015b).

Table 3.7-1 lists the special-status species with a potential to occur in the study area, summarizes habitat preferences, and indicates the likelihood of each species being found in the Project Area. In summary, the following occur within the study area:

- 18 federally listed threatened or endangered species, one proposed threatened species, one candidate species for federal listing, and one federal species of concern. Thirteen of the federally listed species are wildlife, while the remaining five species are plants.
- Two species receiving other protections defined in federal legislation are bald and golden eagles, which are not federally listed but receive special protections under the BGEPA. In addition, the Applicant has requested take of these species under the ITP.
- 20 state species of concern, including nine endangered species, one threatened species, and 10 candidate species. Washington State Code provides that take of state endangered and threatened fish and wildlife is not unlawful if authorized by a permit issued under the ESA (RCW 77.15.120(1)(c), 77.15.130(1)(c)(ii)). The Applicant will therefore meet state requirements for species listed under Washington State Code by securing an ESA ITP that authorizes incidental take of listed species.

Of the 27 special-status species with potential range in the study area, 20 are not expected to occur in the Project Area or are expected to occur only as transients due to lack of suitable habitat (Table 3.7-1). The special-status species that have been observed or are otherwise likely to occur within the study area include marbled murrelet, bald eagle, golden eagle, pileated woodpecker, northern goshawk (*Accipiter gentilis*), Vaux's swift, and Townsend's big-eared bat. These species are addressed in greater detail in the following sections.

Table 3.7-1. Rare, Threatened, and Endangered Species with the Potential to Occur in the Study Area

Species	Federal Status	State Status	General Habitat Description	Observations in Study Area	Potential to Occur in Project Area
Birds					
Marbled murrelet (*Brachyramphus marmoratus*)	T	E	Nearshore marine foragers, but species nests inland in old-growth forests with large trees, multiple canopy layers, and moderate to high canopy closure.	The radar and visual survey detected marbled murrelets flying through the Project Area.	Known
Northern spotted owl (*Strix occidentalis caurina*)	T	E	Mature forests with dense canopies and structurally complex vegetation from British Columbia to Northern California.	No northern spotted owls were observed during avian surveys conducted by Applicant, and study area lacks typical habitat.	Not likely
Streaked horned lark (*Eremophila alpestris strigata*)	T	E	Open areas dominated by grasses and forbs on the Washington coast and Puget lowlands.	This species has potential to pass through the Project Area in migration, but none were observed during Applicant avian surveys.	Not likely
Western snowy plover (*Charadrius alexandrinus nivosus*)	T	E	Sandy coastal beaches, river mouths, lagoons, and estuaries from Southern Washington to Baja California.	Coastal bird that could occur in vicinity of study area project mitigation parcels, but habitat for this species does not occur in or near Project Area.	Not likely
Yellow-billed cuckoo (*Coccyzus americanus*)	T	C	Dense willow and cottonwood stands in river floodplains.	Less than 1% of Project Area is mixed/deciduous forest preferred by species. May pass through in migration, but none were observed during Applicant avian surveys.	Not likely
Bald eagle (*Haliaeetus leucocephalus*)	FCo	--	Nesting in mature trees or snags near water bodies.	Observed during avian use surveys.	Known
Golden eagle (*Aquila chrysaetos*)	--	C	Mountainous, open, arid habitats for hunting and nesting.	Suitable nesting habitat is present in the Project Area, and documented nests are adjacent to the study area.	Known

Species	Federal Status	State Status	General Habitat Description	Observations in Study Area	Potential to Occur in Project Area
Northern goshawk (*Accipiter gentilis*)	--	C	Nesting primarily in Douglas fir trees within mature coniferous forests close to water (Desimone and Hays 2003).	One occurrence observed outside of the Project Area during avian use surveys. Suitable nesting habitat is present in the Project Area.	Known
Pileated woodpecker (*Dryocopus pileatus*)	--	C	Snags or large decaying live trees (Lewis and Azerrad 2003).	Observed during avian use surveys.	Known
Vaux's swift (*Chaetura vauxi*)	--	C	Large, hollow snags and decaying live trees (Lewis et al. 2002).	Observed during avian use surveys.	Known
Mammals					
Townsend's big-eared bat (*Corynorhinus townsendii*)	--	C	Roosting habitat includes large cliff faces, abandoned mines and buildings, and caves. Primary foraging habitat includes open sagebrush shrub steppe and woodlands.	Observed during bat acoustic surveys (ABR, Inc. 2016).	Known
Gray wolf (*Canis lupis*)	E	E	Includes temperate forests, mountains, tundra, taiga, and grasslands.	There are unverified reported sightings of single animals in the study area but no documented sightings within the Project Area; no documented packs as of December 2017.	Low
Canada lynx *(Lynx canadensis*)	T	E	Canadian boreal forest (taiga) to subalpine forest of the North Cascades.	Study area includes known historic range, but there are currently less than 50 individuals in Washington, mostly in northeastern parts of the state.	Not likely
Pocket gopher (*Thomomys mazama* ssp.)	T	T	Glacial outwash prairies.	Range coincides with some areas of the study area, but species is known to inhabit specific soil types that are not found within the Project Area.	Not likely
North American wolverine (*Gulo gulo luscus*)	Pr-T	C	Vegetative and geological generalist but prefers cold areas that receive winter precipitation late into the warm season.	Range overlaps with study area, but species tends to avoid people and developed areas.	Not likely

Species	Federal Status	State Status	General Habitat Description	Observations in Study Area	Potential to Occur in Project Area
Fisher (*Pekania pennanti*)	Pr-T	C	Northern forests of North America.	Fishers have been reintroduced in the Mount Rainer National Park and Gifford Pinchot National Forest to the east of the Project Area. No tagged fishers have been observed in the Project Area, but they have been observed approximately 10 to 20 kilometers to the south and southeast of the Project Area.	Low
Keen's myotis (*Myotis keenii*)	--	C	Roosting habitat includes large cliff faces, abandoned mines and buildings and caves. Riparian and forested areas offer commuting or foraging opportunities.	None observed during bat acoustic surveys (ABR, Inc. 2016).	Not likely
Amphibians and Fish					
Oregon spotted frog (*Rana pretiosa*)	T	E	In or near perennial bodies of water that include zones of shallow water and abundant emergent or floating aquatic plants.	Project Area and adjacent waterways are on the fringe of the species historic range; none observed during the Applicant site characterization surveys.	Not likely
Bull trout (*Salvelinus confluentus*)	T	C	Variable life histories occupying cold water small streams, large rivers, lakes, and reservoirs.	Not documented in the waters in and around the Project Area, and Project Area is not in a Service recovery unit.	Not likely
Insects					
Taylor's checkerspot butterfly (*Euphydryas editha taylori*)	E	E	Coastal grasslands and inland valley and lowland prairies.	Populations near the Project Area appear to be extirpated based on a 2016 Washington State Department of Fish and Wildlife status review.	Not likely
Oregon silverspot (*Speyeria zerene hippolyta*)	T	E	Coastal grasslands near the Pacific Ocean, relies on the early blue violet to complete its life cycle.	Likely extirpated from Washington. Coastal species; may be reintroduced in study area near the proposed project mitigation parcels, but it does not occur in Project Area (WDFW 2015).	Not likely

Species	Federal Status	State Status	General Habitat Description	Observations in Study Area	Potential to Occur in Project Area
Plants					
Marsh sandwort (*Arenaria paludicola*)	E	--	Coastal wetlands and freshwater marshes with or without standing water; acidic, organic bog soils; and sandy substrates with high organic content.	No known populations in study area. Habitat does not occur in Project Area.	Not likely
Golden paintbrush (*Castilleja levisecta*)	T	--	Upland prairies on generally flat grasslands, with low deciduous shrubs commonly present as small to large thickets.	Occurs in study area, but suitable habitat does not occur in Project Area (Chambers Group and WEST 2019).	Not likely
Kincaid's lupine (*Lupinus sulphureus* ssp. *Kincaidii*)	T	--	Primarily fescue-dominated upland prairie, occasionally found on steep, south-facing slopes and barren rocky cliffs.	Occurs in study area, but suitable habitat does not occur in Project Area (Chambers Group and WEST 2019).	Not likely
Nelson's checker-mallow (*Sidalcea nelsoniana*)	T	--	Oregon ash (*Fraxinus latifolia*)-dominated swales and meadows with wet depressions, along streams, or wetlands within remnant prairie grasslands.	Occurs in study area, but suitable habitat does not occur in Project Area (Chambers Group and WEST 2019).	Not likely
Water howellia (*Howelia aquatilis*)	T	--	Mosaic wetland dominated by Oregon ash or Oregon white oak (*Quercus garryana*), often bordered by Douglas fir forest.	Occurs in study area, but suitable habitat does not occur in Project Area (Service [date unknown]).	Not likely
Whitebark pine (*Pinus albicaulis*)	C	--	Cold and windy high-elevation or high-latitude sites in western North America. Typically found with other high-mountain conifers just below the timberline.	Range extends into Project Area, but species is not cultivated in actively harvested timberlands. Dependent bird species Clark's nutcracker (*Nucifraga columbiana*) was not noted during Applicant avian surveys. This species is unlikely to occur in the Project Area (Ettl and Cottone 2004).	Not likely

Notes:
--: not applicable
C: candidate
E: endangered
Pr-T: proposed threatened
T: threatened
SC: state candidate
FCo: federal species of concern

3.7.1 Marbled Murrelet

The marbled murrelet is a small (23- to 24-centimeter) seabird that inhabits the coastal forests and nearshore marine environment along the West Coast of North America. Marbled murrelets are a stocky bird capable of both underwater and aerial flight with a dark bill and dark brown tail with white on the underside. In the winter, the marbled murrelet develops white on the scapulars, while in the breeding season it exhibits dark plumage. It is similar in appearance, but genetically distinct, to both the Kittlitz's and long-billed murrelet (*Brachyramphus brevirostris* and *Brachyramphus perdix*, respectively). Marbled murrelets were federally listed as threatened under the ESA in 1992 in Washington, Oregon, and California, primarily due to loss of old forest nesting habitat from commercial timber harvesting and mortality associated with net fisheries and oil spills. Subsequently, Washington State listed the species as threatened in 1993. However, the Washington State Department of Fish and Wildlife uplisted marbled murrelets to endangered in 2016 (Desimone 2016).

Murrelets are found in coastal marine areas (generally within 5 to 8 kilometers [3.1 to 5.0 miles] of shore) from the Aleutian Islands of Alaska south along the Pacific coast to central California (Ridgley et al. 2007; Nelson 1997). Six marbled murrelet conservation zones have been designated for the ESA-listed population. Five of the marbled murrelet conservation zones (1 through 5) are monitored by the Northwest Forest Plan Effectiveness Monitoring Program. Two of these zones are located in Washington: Zone 1 includes the Strait of Juan de Fuca, Hood Canal, Puget Sound, and the San Juan Islands, and Zone 2 includes the Washington outer coast. These two zones comprise the population potentially impacted by the project, while all five zones comprise the population considered in the cumulative analysis.

The population estimate for Zone 1 in 2016 was 4,614 birds with a 4.9% average annual rate of decline for the 2001-to-2016 period (Pearson et al. 2018). The population estimate for Zone 2 in 2017 was 1,758 birds with a declining trend of -2.4% (not statistically significant) average annual rate of decline for the 2001-to-2017 period (Pearson et al. 2018).

While there is a high level of variation in annual population estimates in Washington, the trend over time suggests a clear decline in Washington's inner waters (Zone 1) and a possible decline in coastal waters of Zone 2. The overall Washington murrelet population of 7,095 birds declined 3.9% per year from 2001 to 2016 (Pearson et al. 2018). In Washington, the current and historical marine distribution of murrelets includes the Salish Sea (Puget Sound, Strait of Juan de Fuca) and the outer coast. Marbled murrelets in Washington have particularly large marine ranges during the breeding season, and they also fly especially long distances between their nesting and marine foraging sites (Lorenz et al. 2017). Marbled murrelet nesting habitat distribution in Washington includes coniferous forest within about 88.5 kilometers (55 miles) of marine waters as defined in the federal Northwest Forest Plan (Falxa et al. 2016). While most nest sites have

been located within 64.3 kilometers (40 miles) of marine waters, murrelet presence has been documented up to 112.7 kilometers (70 miles) inland in Washington (Evans Mack 2003).

Marbled murrelets lay a single egg, which may be replaced if egg failure occurs early in the nesting cycle, but this is likely rare (Nelson 1997). Murrelet nesting is asynchronous and spread over a prolonged season. In Washington, the murrelet breeding season extends from April to late September (Service 2012a), but an individual nesting cycle is typically about 60 days, with egg incubation lasting about 30 days and chick rearing lasting about 30 days (27 to 40 days). Egg laying and incubation occur from April to into August, and chick rearing occurs between late May and September, with all chicks fledging by late September (Nelson et al. 2003; Service 2012a). Both sexes incubate eggs. Incubation shifts are generally 1 day, with exchanges occurring at dawn. After hatching, chicks are brooded for 1 to 2 days and then left alone in the nest for the remainder of the chick rearing period. A chick typically receives one to eight meals per day, provided by either parent, which usually consist of a single fish, carried in the bill. Roughly two-thirds of meals are delivered early in the morning before sunrise, and one-third are delivered at dusk. A few meals may additionally be scattered throughout the daytime (McShane et al. 2004).

Most active murrelet nests that have been detected and monitored have failed, predominantly due to predation. Corvids are the primary predators of both eggs and chicks; however, several other species of birds, as well as squirrels and other mammals, may also predate nests. Similarly, mortality in adult birds is largely attributed to predation, mainly by raptors and corvids. However, other causes of mortality include collision with vehicles and transmission wires and entanglement in discarded fishing nets (McShane et al. 2004).

3.7.1.1 Project Area

The Project Area does not contain nesting habitat for marbled murrelets but is located in a flight corridor used by marbled murrelets that fly through the Project Area when transiting between marine foraging areas and nesting habitat located inland of the Project Area. The proposed WTGs would be constructed along a high ridgeline that separates the Skookumchuck River watershed from the Newaukum River and Tieton River watersheds to the south. While murrelets are known to typically follow rivers and streams when flying inland, they will also fly over ridges to access nesting habitat in adjacent watersheds (Burger 2001).

There are four documented occupied marbled murrelet sites located within an 8-kilometer (5-mile) radius of the proposed WTGs. The nearest known occupied site is located on Weyerhaeuser property in the upper Newaukum River watershed approximately 0.6 kilometer (0.4 mile) from the closest WTG (Chambers Group 2018). Two additional occupied sites have been documented in designated marbled murrelet critical habitat to the east and southeast of the Project Area on the Gifford Pinchot National Forest. A fourth occupied site is located along the North Fork of the Newaukum River on private timber lands approximately 6.4 kilometers (4 miles) southwest of the Project Area.

Additional marbled murrelet presence occupancy and presence detections have been located further east of the Project Area on both private and National Forest lands. The marbled murrelet sites located eastward of the Project Area represent the southern extent of the inland distribution of marbled murrelets in the Washington Cascades. A radar and visual study of marbled murrelets was conducted during the summer breeding periods in 2013 and 2014 (ABR, Inc. 2011, 2015a, 2015b). The objectives of the study were to quantify and characterize flight patterns of marbled murrelets in the Project Area and assess potential risk of marbled murrelet collision fatalities at proposed WTGs. Surveys were conducted at 10 different count locations from mid-May to early August during the morning activity period for marbled murrelets, defined as 105 minutes before sunrise to 75 minutes after sunrise. Fifty surveys were conducted in 2013 with a total of 26 detections, and 70 surveys were conducted in 2014 with a total of 47 detections. The overall passage rate averaged across both seasons was 0.61 ± 0.09 targets per morning. Each murrelet "target" is estimated to represent 1.5 birds to account for small flocks that cannot be identified by radar, indicating an average passage rate of about one marbled murrelet flying over the Project Area ridgeline each morning (ABR 2015). Additional marbled murrelet flights through the area are likely to occur during daylight and evening hours. While these time periods were not surveyed directly, the risk assessment for this project includes estimates for the additional flights that are likely to occur during daylight and evening hours. Though flight directions were variable at each station, slightly more seaward flights versus landward flights were observed. Flight altitudes were measured for 21 marbled murrelet targets. Marbled murrelet flight heights averaged 219 meters (718 feet) above ground level. Analysis of the flight height data indicated 40% of the flights were below the maximum proposed WTG blade height of 150 meters (492 feet) above ground level (Chambers Group 2018).

3.7.1.2 Conservation Lands

Parcel A is 320 acres and composed of mixed-conifer stands dominated by western hemlock with minor components of Douglas fir and Sitka spruce. The parcel is bisected by Freshwater Creek and various unnamed tributaries that contain flight corridors along with suitable nesting habitat found throughout the parcel. Over half of the parcel is composed of stands greater than 60 years old. Audio-visual surveys were conducted at the parcel during the 1999-to-2000 nesting periods. Of the nine records in the Washington State Department of Fish and Wildlife murrelet database, three detections of two individuals each were observed flying at canopy height (1X), all of which occurred during one morning in early August 2000. Based on stand inventory data, detections were made in stands that were approximately 20 to 45 years old but contained the legacy structures that are still present throughout the stands. Occupied habitat associated with the subcanopy behaviors was delineated in winter 2018 following Washington State Department of Natural Resources (DNR) guidelines and consists of one site that is approximately 10 acres. Areas of moderate- to high-quality nesting habitat are found in 75-year-old riparian areas that bisect the middle of the parcel and pockets of decadent legacy trees that were retained in 61-year-old stands in the north-central portion of the parcel.

Parcel B is a 299-acre parcel similar to Parcel A in habitat characteristics. Over half of the parcel is composed of stands greater than 70 years old. Several areas contain occupied marbled murrelet sites, and observations of flight behavior are indicative of nesting. Audio-visual surveys were conducted at the parcel during the 1999-to-2000 and 2004-to-2006 nesting periods. Of the 38 records in the Washington State Department of Fish and Wildlife database, 18 (47%) were classified as occupied behavior. Of the 18 occupied behaviors, the majority (n = 13, 72%) were observed circling above the canopy, while five were birds circling equal to or below the canopy.

3.7.1.3 Marine Environment

Marbled murrelets are found along the Pacific Coast from the Aleutian Islands through central California. The highest densities of marbled murrelets in Washington waters during the breeding season are found on the northern outer coast, northern Puget Sound, and the Strait of Juan de Fuca (Miller et al. 2006; Lance and Pearson 2007; Lance et al. 2013; Falxa et al. 2016). There is considerable variation in home range size and movement behavior across the species' range (Hull et al. 2001; Bloxton and Raphael 2009; Barbaree et al. 2014). Murrelet use of marine waters is usually within 2 to 8 kilometers (1.2 to 5.0 miles) of shore (Nelson 1997; Hébert and Golightly 2008).

3.7.1.4 Marbled Murrelet Critical Habitat

Marbled murrelet critical habitat in Washington is designated in 37 critical habitat subunits that encompass over 1.63 million acres, located primarily on National Forest lands. Marbled murrelet critical habitat subunit WA-11-c encompasses over 37,000 acres and is located east of the Project Area in the "Mineral Block" of the Gifford Pinchot National Forest. The Project Area footprint does not directly overlap with designated marbled murrelet critical habitat (Figure 1.1-1). Other areas of designated critical habitat in the Project Area vicinity include the Capitol State Forest in Thurston County, about 38.6 kilometers (24 miles) to the northwest of the Project, and near Willapa Bay, about 51.5 kilometers (32 miles) to the southwest.

3.7.2 Bald and Golden Eagle

The analysis of effects on bald and golden eagles for each alternative is conducted at two geographic scales. The Service uses the following scales to evaluate potential impacts to eagle populations (Service 2013):

- **Eagle Management Unit.** The EMU is one geographic scale over which permitted take is regulated to meet the Service's management objective of stable or increasing breeding populations (Service 2013). EMUs for both species are defined, with some modifications, by the four administrative flyways used by state and federal agencies to administer migratory bird resources. The Project falls entirely within the Pacific Flyway EMU. For bald eagles, the Pacific Flyway is divided into three distinct EMUs: the southwest EMU (south of 40 degrees north latitude), the mid-latitude EMU (north of 40 degrees to the Canadian

border), and the Alaska EMU (Service 2013). The Project falls entirely within the mid-latitude EMU for bald eagles.

- **Local Area Population.** The LAP is the population of eagles within a distance from the project footprint equal to the species' natal dispersal distance. This value is 138 kilometers (86 miles) for bald eagles and 175 kilometers (109 miles) for golden eagles (Service 2013).

Bald and golden eagles range over large geographic areas across North America and use a variety of habitats. Bald eagles are typically found near bodies of water including lake shorelines, rivers, and coastal areas (Service 2016a), while golden eagles typically occupy more mountainous terrain and open, arid environments typical of the western United States. Both eagle species may use different habitats based on breeding, migration, and wintering and availability of prey and level of disturbance (Buehler 2000).

Though bald eagles were once threatened or endangered everywhere in the United States except Alaska, populations have rebounded, and the Service removed the species from the list of threatened and endangered species in 2007. Golden eagle populations, conversely, appear to be declining slightly across North America.

Bald eagles generally nest in mature trees or snags in forested areas near bodies of water that offer foraging opportunities (Buehler 2000). Though rarer, they will nest on cliffs, in shrubs, and on the ground where trees are not available. With increasing frequency, they will also nest on human-made structures, such as power poles and communications towers (Millsap et al. 2004). Key factors influencing nest site selection include forest size and structure, quality of foraging areas, and low human disturbance (Buehler 2000). Migrating and wintering eagles can be highly social, gathering in large numbers near open water or other areas rich in food resources.

Golden eagles generally breed in open or semiopen areas in tundra, shrubland, grassland, and desert rimrock, but generally avoid urban and heavily forested areas (Kochert et al. 2002). Golden eagles usually nest on rock ledges and cliffs, but they also nest in large trees, steep hillsides, and—rarely—on the ground (Kochert et al. 2002). When migrating, golden eagles are associated with features such as cliff lines, ridges, and escarpments, where they take advantage of uplift from deflected winds. They often forage over open landscapes, using thermals to move efficiently.

Both bald and golden eagles were observed within the Project Area during studies conducted from January 2016 to December 2017. Both species were observed flying within the 1-kilometer (0.6-mile) turbine buffer zones and within rotor swept heights. Bald eagles were most prevalent during winter and spring (December to May), while golden eagles were most prevalent during fall and winter (September to February). Both species were observed in the Project Area during all seasons (Chambers Group 2018).

Bald eagles are known to occur within the conservation lands. Currently, there are 21 previously documented bald eagle nests within 16.1 kilometers (10 miles) of the conservation parcels (WDFW 2018c). Of the 21 nests, three nests within the Lynn Point territory are located between 1.6 and 2.7 kilometers (1 and 1.7 miles) west of the conservation parcels. Bald eagle nests are located along the South Fork of the Nemah River and were surveyed in 2018, but no status was provided (WDFW 2018c). As noted in Section 4.6, waterways within the conservation lands provide food resources in the form of a variety of fish. In addition, the conservation lands contain suitable perch, roosting, and nesting habitat in large, emergent western hemlock and Sitka spruce trees. Golden eagles may also occur within the conservation lands, as the habitat is similar to the Project Area; however, in forested habitat they tend to be associated with cleared areas where they forage, particularly for mountain beaver (*Aplodontia rufa*). Similar to the Project Area, golden eagles would likely be less prevalent in the conservation parcels but would be expected to use the area occasionally, particularly during migration.

Bald and golden eagles also occur within the area targeted for the eagle power pole retrofit program, as it traverses multiple habitats preferred by both bald and golden eagles. Golden eagles likely use the more remote portions of the area targeted for the eagle power pole retrofit program, while bald eagles are likely to be relatively abundant in more densely populated portions of the service area, particularly west of the Cascades. They may even be expected to use PacifiCorp infrastructure on occasion for nesting, given their propensity to do so in other parts of the country (Millsap et al. 2004).

3.7.3 Pileated Woodpecker

The pileated woodpecker is a candidate species for listing in Washington state that creates nesting cavities used by other wildlife species, making it a keystone habitat modifier (Lewis and Azerrad 2003). These birds breed and nest between late March and early July, excavating large nests and preying on insects. Large snags and decaying trees are required for woodpecker nesting and roosting. Pileated woodpeckers were observed during avian use surveys in the Project Area.

It is likely that pileated woodpeckers would occupy areas that intersect with the area targeted for the eagle power pole retrofit program, as they are known to adapt to some urban and suburban areas throughout Washington (Lewis and Azerrad 2003). Snags and downed trees in logged habitat and along the forest edges provide habitat for woodpeckers. Due to the similarities in the available forested and logged habitat, pileated woodpeckers are also expected to occur within the conservation lands.

3.7.4 Vaux's Swift

The Vaux's swift is a candidate species for listing in Washington State. Vaux's swifts use hollow trees and snags within forested habitats in Washington between May and September each year. The swifts prefer coniferous old-growth forest, and they nest and roost in hollow trees excavated

by pileated woodpeckers. Vaux's swifts can also be found nesting or roosting in chimneys. Flying insects are the primary prey for swifts that forage in forests, grasslands, and riparian or aquatic areas (Lewis et al. 2002).

These birds were observed in the Project Area during avian use surveys. It is likely that Vaux's swifts would also occupy the conservation lands, where there is similar forested habitats and nesting structures. They are also likely to be found in the area targeted for the eagle power pole retrofit program, in chimneys within more developed areas, or within swatches of forests with available cavities created by pileated woodpeckers.

3.7.5 Northern Goshawk

The northern goshawk is a candidate species for listing in Washington State. Northern goshawks have likely been extirpated from developed urban landscapes in the state (Desimone and Hays 2003). These birds breed between March and September, utilizing mature, dense coniferous forests. Northern goshawks require a large area for nesting, fledging, and foraging with little to no human disturbance.

Only one northern goshawk was observed during avian use surveys, and it was observed outside of the Project Area. Because of similar habitat conditions in the conservation lands, it is anticipated that occupancy by northern goshawks would be similar to that in the Project Area. It is not likely that northern goshawks would intersect with the developed portions of the area targeted for the eagle power pole retrofit program, due to the proximity to human disturbance.

3.7.6 Townsend's Big-Eared Bat

Townsend's big-eared bat is a candidate species for listing in Washington State. Townsend's big-eared bats emit low-decibel echolocation calls, making it possible, although difficult, to detect acoustically (Gruver and Keinath 2006). The Project lacks large areas of suitable roosting habitat (e.g., large cliff faces, abandoned mines and buildings, and caves), and detections during bat acoustic surveys were rare (ABR, Inc. 2016). In a study conducted in Deschutes County of central Oregon, Townsend's big-eared bats moved up to 24 kilometers (14.9 miles) from roosting habitats (hibernacula) to foraging areas where they primarily foraged over habitat consisting of open sagebrush shrub-steppe and open ponderosa pine woodlands (Dobkin et al. 1995). Although it is unknown where this species roosts relative to the Project Area, it is clear they are able to travel long distances between roosting and foraging locations.

The likelihood of occurrence of Townsend's big-eared bat in the conservation lands is expected to be similar to the Project Area, based on similar habitat and the availability of foraging areas, roost trees, and water resources. Additionally, Townsend's big-eared bat presence is expected in the area targeted for the eagle power pole retrofit program, where more developed areas provide suitable foraging and roosting habitat.

3.8 Land Use and Recreation

This section describes existing land uses, including any recreational areas within the study area.

The proposed Project facilities are located in unincorporated areas of Lewis and Thurston counties in a relatively rural area. As noted in Section 3.5, the largest land cover class in the Project Area is Evergreen Forest. The proposed WTGs and most Project facilities are located within the Vail Tree Farm, which is privately owned by Weyerhaeuser and actively managed for commercial timber harvest. There are no dwellings within the Project Area, and the closest residence is approximately 5.1 kilometers (3.2 miles) from the nearest WTG. There are small areas of Natural Resources Conservation Service (NRCS)-mapped prime farmland soils (USDA 2018) in the western end of the transmission line with some agricultural uses, mainly located near the towns of Rainier to the north and Bucoda to the west.

Weyerhaeuser provides access to its privately-owned lands, including the Vail Tree Farm, by permit. Permitted activities include collecting berries, mushrooms, and firewood for personal use; conducting dispersed camping; and hunting. The nearest public recreational area is located in the Mineral Block area of the Gifford Pinchot National Forest, which is approximately 0.7 kilometer (0.4 mile) from the closest WTG.

The conservation lands are currently managed as private industrial forest land that has a timber harvest rotation of approximately 40 to 45 years. The most recent timber harvest occurred in 2003 (Chambers Group 2018). In general, the vicinity is rural residential with the closest residence about 1 kilometer (0.6 mile) from the west boundary of Parcel A and about 2 kilometers (1.2 miles) from the north boundary of Parcel B (the same residence).

Both parcels are within 8 kilometers (5 miles) of Willapa Bay and the Service's Willapa National Wildlife Refuge Complex, which consists of approximately 17,000 acres of protected habitat within the Willapa Bay coastal areas (Figure 2.3-1). Recreation opportunities include boating access, fishing, camping, hunting, and hiking/wildlife viewing. The Johns River Wildlife Area – Nemah River Estuary Unit, managed by the Washington Department of Fish and Wildlife, is located to the northwest of the conservation lands, providing recreational wildlife viewing trails. The conservation lands are also situated directly adjacent to the South Nemah Natural Resource Conservation Area to the southeast, which is managed by DNR and is designated as occupied marbled murrelet critical habitat area (Figure 2.3-1).

Within the area targeted for the eagle power pole retrofit program, power pole infrastructure is located across a diverse array of land uses, ranging from transportation corridors to private and public lands in developed areas and in more rural areas. In all cases, PacifiCorp has the right-of-way to locate and maintain these proposed facilities regardless of the underlying or adjacent land

use. Although there are numerous recreational resources within the area targeted for the eagle power pole retrofit program, none are located within the transmission line right-of-way.

3.9 Visual Resources

This section describes visual resources, including scenic vistas or landforms of interest, the existing visual character and any sources of light or glare, and the location of sensitive receptors.

The Project Area is located in a relatively rugged, remote forested area. There are no designated scenic vistas in the vicinity of the Project Area, although U.S. Highway 12 (White Pass Scenic Byway) is located 16.1 kilometers (10 miles) from the proposed southernmost WTG. Existing sources of light and glare in and near the Project Area are limited. Minimal light and glare from forestry activities occurs within the Vail Tree Farm, and there are no buildings with exterior lights.

The conservation lands are located within coastal forested lands. The topography consists of rolling hills and ridgelines that are mainly forested, with some areas of open space where more recent timber harvest has occurred. Similar to the Project Area, viewer groups within the parcels are limited. Views of the conservation lands from the surrounding area consist mainly of motorists and recreationists participating in activities including hiking, fishing, camping, and paddling (DNR 2018a; WDFW 2018d). The visual landscape within the area targeted for the eagle power pole retrofit program varies from urban development near major cities and towns to more rural areas that range from forests to agricultural lands.

3.10 Cultural and Historic Resources

This section describes the cultural and historic resources known or likely to occur within the study area with the potential to be affected by the Proposed Action. Cultural and historic resources include prehistoric or historic sites, districts, buildings, structures, or objects that are listed or are eligible for listing on the National Register of Historic Places (NRHP) and deemed worthy of preservation.

A Phase I Cultural Resources Inventory (Chambers Group 2018) was prepared in accordance with the Washington State Environmental Policy Act, Lewis County's guidelines and GMA Goal 13, and Section 106 of the NHPA guidelines for cultural resources. The results of these studies were provided to the Service and the Washington State Historic Preservation Officer.

The literature review for this effort found that one previous cultural resources study occurred within the Project Area but that no previous cultural resources have been reported. A total of four prior studies had occurred within a 1-mile radius of the Project Area, and of those, 31 resources have been identified, including one prehistoric resource and 30 historic-period built environment resources.

Field surveys of the accessible area occurred from September 7 through 26, 2016, and September 20 through 25, 2017. The area studied consists of approximately 2,984 acres. The overall site conditions include low ground visibility and uneven, unsafe terrain due to historic and current lumber harvesting, which has been ongoing for over 100 years. These activities have left behind a high amount of slash/logging debris. Because of these conditions, over 50% of the study area was inaccessible. As such, approximately 1,500 acres were accessible to survey and subsurface testing. One prehistoric isolated artifact was recorded; however, the isolate is not recommended to be eligible under any criteria for the NRHP or the Washington Heritage Register.

3.11 Tribal Resources

Tribal resources refer to the collective rights and access to traditional areas and periods for gathering resources associated with a tribe's sovereignty or formal treaty rights. These resources may include plants or fish used for commercial, subsistence, or ceremonial purposes.

On May 7, 2018, the Service contacted 34 Native American tribes in Washington, Oregon, and Idaho by letter requesting comment on the issuance of the permit. Letters were addressed to tribal leaders and copied to tribal natural resources staff. The tribes that were contacted are listed in Chapter 7. As of the publication of this document, no responses have been received related to the request for input related to the Proposed Action, including issues related to the potential for and mitigation of take of the Covered Species.

3.12 Transportation

This section describes various transportation resources within the study area that could potentially be affected by the Proposed Action.

The proposed Project facilities are located east of I-5 and south and east of State Road 507 and would be accessed from these corridors via several state routes serving the communities to the north (Figure 1.1-1). Secondary access to the proposed Project facilities would occur from the south. The closest public road to the Project is Vail Loop Road SE. During operation, access to the Project site would be via existing private access roads currently used for silvicultural operations within the Project Area. Existing roads in the Project Area are generally 4.9 to 6.1 meters (16 to 20 feet) in width. To minimize the potential for vehicle collisions with wildlife species during Project O&M, vehicle speed limits of 40.2 kilometers (25 miles) per hour will be posted and enforced for operations staff within the Project Area.

There are no rail services or waterways serving the proposed Project facilities or conservation lands. The Project Area is not served by public transit, as it is located on private land used for timber production. The nearest transit system, Twin Transit, is in the city of Chehalis. Several public and private airports and private runways are located within 24.1 to 32.2 kilometers (15 to 20 miles) of the

proposed Project facilities. As noted in Section 2.1.2.8, the WTGs will be constructed in accordance with FAA safety standards to ensure there are no conflicts with these facilities.

The main transportation resources within the Mitigation Areas include public roadways. Access to the conservation lands is provided by U.S. Highway 101 near the town of Nemah, Washington. Access within the parcels is provided by private roadways used mainly to access timber harvest areas. Within the area targeted for the eagle power pole retrofit program, the power pole transmission infrastructure is located within PacifiCorp's right-of-way, which in some cases runs along public roadways.

3.13 Noise

This section describes the existing sources of noise sensitive receptors that are located within the study area.

Existing sources of noise in the Project Area consists of periodic timber harvest of forested lands, with some agricultural and reclamation-related activities located along Big Hanaford Road. There are scattered residential areas near the more populated areas of Rainier, Tenino, and Bucoda. Residential noise receptors are shown in Figure 2.1-1. With respect to the WTGs, the nearest residences are located approximately 5.1 kilometers (3.2 miles) from the northernmost WTG. There are also some residences located approximately 0.4 kilometer (0.3 mile) from the O&M facility. Other residential areas near the Project Area are located farther from the proposed Project facilities. Existing noise levels within the study area are relatively low, with some occasional noise from the surrounding silvicultural, agricultural, and reclamation activities. There are no substantial sources of vibration.

Noise within the conservation lands are similar to those in the vicinity of the Project and consist mainly of low levels of noise from rural residential uses and periodic timber harvest. Within the area targeted for the eagle power pole retrofit program, noise levels vary widely, with higher levels generally occurring in the more urbanized cities and towns related to increased human activity.

3.14 Public Services and Utilities

This section describes resources-related public services, including fire protection and law enforcement services and utilities, including transmission lines.

Limited public services or utilities exist within or near the Project Area beyond fire protection and law enforcement services. Portions of the Project Area in Lewis County are within Lewis County Fire Protection Districts No. 1, No. 6, and the Riverside Fire Authority (consolidated from Fire Protection District No. 12 and City of Centralia) (Lewis County 2017). The O&M facility is within the Southeast Thurston Regional Fire Authority, but portions of the Project access road improvements would be constructed outside the boundaries of any

Thurston County fire district. Portions of the Project constructed outside of the boundaries of Thurston County or Lewis County fire districts are serviced by DNR's on-call wildland firefighting services in the South Puget Sound Region (Thurston County) and Pacific Cascade Region (Lewis County) (DNR 2018b). Law enforcement in the Project Area is serviced by sheriff's departments in both Lewis and Thurston counties.

Utility service lines that run through the Project Area include the Bonneville Power Administration's 230-kilovolt (kV) Chehalis-to-Covington No. 1 (electricity) line (BPA 2018), British Petroleum Olympic refined petroleum products pipeline, and Williams Northwest natural gas pipeline (WUTC 2017). These three lines run roughly parallel to each other underground.

There are limited public services and utilities located within the conservation lands because the lands are privately owned and operated. Fire protection services in the conservation lands are provided by DNR's on-call wildland firefighting services under the Pacific Cascade Region and may be supported by Pacific County Fire Districts No. 4 and No. 7 (Pacific County 2012). The Pacific County Sheriff's Office serves rural and unincorporated portions of the county, including the proposed conservation lands (Pacific County 2010). Electric or gas utilities are not present within the conservation lands. The area targeted for the eagle power pole retrofit program covers a wide array of land use types; there are also various public services and utilities within and crossing the area. Most notably, the transmission line infrastructure is a utility service that provides power to approximately 1.9 million customers (PacifiCorp 2018).

3.15 Health and Safety

This section describes health and safety considerations in the study area, including the potential for natural disasters like wildfires and lightning strikes, working conditions, and other operational factors (such as wind shear, ice throw, and shadow flicker). Geologic hazards are addressed in Section 3.2.

Wildfire season generally runs from April 15 through October 15, depending on snowpack and drought conditions (DNR 2018c). Thurston and Lewis counties have a moderate fire danger rating and burn risk (DNR 2018b). Weyerhaeuser, as an owner and operator of commercial forestry lands, has established general "fire safe" practices in accordance with state fire protection laws and Industrial Fire Precaution Levels (IFPL) rules established by DNR (Washington Administrative Code 332-24-301). Equipment onsite includes fire suppression trucks, along with appropriate hand tools and firefighting equipment as recommended or required by DNR's IFPL rules and regulations and Weyerhaeuser's fire plan.

Due to the elevated and remote location of typical wind facilities, wind facilities may present a heightened risk of being struck by lightning and incurring damage from the electric current and/or mechanical shock wave associated with lightning strikes.

Wind facility operations also present potential health and safety risks for workers. For example, workers may be required to use chemicals when maintaining turbine blades, which may expose them to harmful gases, vapors, and dusts. Occupational Safety and Health Administration (OSHA) regulations that apply to ventilation requirements and the proper use of respiratory protection equipment are provided under 29 CFR 1910.94 (Ventilation) and 1910.34 (Respiratory Protection). Maintenance workers may also be required to work at extreme heights on WTGs. OSHA has developed occupational safety standards related to falls in the general workplace (29 CFR 1910). OSHA regulations under 29 CFR 1910, Subpart D (Walking-Working Surfaces [1910.21 through 1910.30]) apply to the design of fixed ladders that will be installed within the WTGs, including requirements for fall arrest systems such as cages, wells, and landing platforms.

Other potential health and safety risks associated with the operation of WTGs include wind shear and ice throw. Wind shear is a change in wind speed and/or direction over a relatively short distance in the atmosphere, which can lead to unsteady blade air performance and possibly result in turbine component damage. Ice throw occurs when ice that has gathered on the turbine and its parts becomes dislodged due to temperature increase, wind, movement of the turbine, or other external factors (such as vibrations or gravity). This can lead to ice being flung into the air, causing potential risk of damage or injury to other structures, vehicles, site personnel, and the general public. A number of design standards have been developed for WTGs that address these and other occupational health and safety hazards.

Health and safety considerations within the conservation lands are similar to the Project Area to the extent these areas are also actively managed forest lands in rural areas. Within the area targeted for the eagle power pole retrofit program, ongoing O&M activities of transmission line infrastructure presents some degree of risk to workers and the public; however, these risks are addressed through compliance with OSHA regulations on Electric Power Generation, Transmission, and Distribution Maintenance and Construction (29 CFR 1910.269 and 29 CFR 1926, Subpart V) and are not any higher than normal utility pole O&M risks.

3.16 Socioeconomics

This section describes socioeconomic factors present in the study area at a regional scale to capture broader economic impacts related to employment and income and at a local scale to capture more immediate impacts on population, housing, and government revenue. The regional scale includes Thurston, Lewis, and Pacific counties, where Project activities would occur, and the region’s economic centers of Olympia, Tacoma, and Seattle, which include the Seattle-Tacoma Combined Statistical Area (CSA) or the Metropolitan Statistical Area (MSA),

depending on availability of data. The local scale includes Lewis, Thurston, and Pacific counties.[7]

3.16.1 Employment and Income

In 2016, almost 3 million people age 16 years and older were employed either full-time or part-time in the regional study area (BEA 2016). Table 3.16-1 shows total employment in the regional study area from 2010 to 2016, including the change in number of jobs during this period.

Table 3.16-1. Total Employment (Jobs), 2010 to 2016

Geographic Area	2010	2016	Percent Change	Average Annual Growth Rate
Seattle-Tacoma-Bellevue MSA	2,156,605	2,524,461	17.1%	2.7%
Lewis County	33,039	34,785	5.3%	0.9%
Thurston County	128,757	145,621	13.1%	2.1%
Pacific County	9,321	10,035	7.7%	1.3%

Notes:
This analysis uses the MSA instead of the Seattle-Tacoma CSA due to the geographic boundaries of the CSA changing between 2010 and 2016.
Source: BEA 2016

Employment in both Lewis and Thurston counties is concentrated in government; wholesale and retail trade; and education, health care, and social assistance. Employment in Pacific County is also concentrated mostly in government, manufacturing, transportation, leisure/hospitality, and other service-based industries. Washington State's capital city, Olympia, is located in Thurston County, resulting in a large percentage of government employment. All three counties have about the same percentage of workers in the service and entertainment sectors.

Per capita income allows the comparison of average income per person across geographies. The gross domestic product of the Seattle-Tacoma-Bellevue MSA exceeds $300 billion. Per capita incomes across Lewis, Thurston and Pacific counties have increased on a real basis since 2010 (Table 3.16-2). Total earnings by sector are distributed similarly to employment, with government; wholesale and retail trade; and education, health care, and social assistance accounting for the highest percent of earnings.

[7] The local scale focuses on the area where the Project and conservation lands would occur because land conversion in these areas from timber uses to Project uses would result in changes in government revenue.

Table 3.16-2. Inflation-Adjusted Per Capita Income, 2010 to 2016

Geographic Area	2010	2016	Percent Change	Average Annual Growth Rate
Seattle-Tacoma-Bellevue MSA	$52,515	$64,553	22.9%	3.5%
Lewis County	$35,084	$38,586	10%	1.6%
Thurston County	$43,306	$45,932	6.1%	1%
Pacific County	$37,534	$42,039	12%	2%

Note:
Source: BEA 2016

3.16.2 Population and Housing

At the local scale, Centralia is the largest city in Lewis County, with a population of almost 17,000. The nearest incorporated city to the Project is Rainier in Thurston County, which has about 2,100 people (BEA 2016). Tono (approximately 1.4 kilometers [0.9 mile] from the gen-tie line) and Vail (approximately 0.8 kilometer [0.5 mile] from the O&M facility) are the closest unincorporated communities to the Project. The largest city in Pacific County is Raymond, with a population of 2,821.

The nearest residence to the WTGs is located approximately 5.1 kilometers (3.2 miles) northwest of the northernmost WTG. Residences are also located near the O&M facility in the unincorporated community of Vail. There are no residences located within the Project Area or conservation lands.

3.16.3 Government Revenues

Within the study area, the following government revenues are collected and provide financial benefit to the public at large.

- Retail sales and use tax, which yielded over $10 billion in fiscal year 2016 (WSDR 2018a). The sales tax is paid for goods and services purchased within Washington.
- Real and personal property taxes, which include annual taxes paid to the local government for land and any improvements, such as buildings attached to the land, including transmission line rights-of-way. Personal property includes structures not affixed to the land, and the Washington State Department of Revenue has determined that energy project infrastructure is considered personal property. Property tax collections in 2015 were about $342 million in Thurston County, $76 million in Lewis County, and $29 million in Pacific County. Assessed value was about $26.8 billion in Thurston County, $7 billion in Lewis County, and $2.2 billion in Pacific County (WSDR 2016a).
- Timberland excise taxes of 5% is paid by landowners when timber is harvested. The revenue is split, with 4% going to the county where the harvest occurs and 1% to the state general fund. Distributions of the timber excise tax in fiscal year 2016 produced about $785,000 for

Thurston County, $2,887,000 for Lewis County, and $1,441,000 for Pacific County (Washington State Auditor 2018).

- The Public Utility Tax is assessed on the gross income derived from the operation of a business or utility (in this case, one that is engaged in the supply of energy) and is charged in lieu of the Business and Operations tax. The tax rate on generation/distribution of electrical power is 3.872% (WSDR 2018b). Collections in 2016 were $420,623,000, about 2.3% of all state taxes, and went to the state general fund (WSDR 2016b).
- Other taxes in Washington include lodging taxes, fuel taxes, license taxes, and real estate excise taxes.[8] Washington does not tax personal income (WSDR 2017, 2018c, 2018d; Association of Washington Cities 2017).

3.17 Environmental Justice

The concept of environmental justice is rooted in the Civil Rights Act of 1964, which prohibited discrimination in federally assisted programs and was followed by Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which was issued on February 11, 1994. Executive Order 12898 was intended to ensure that federal actions and policies do not result in disproportionately high adverse effects on minority or low-income populations. Environmental justice issues are mandated and regulated at the federal level, and compliance with NEPA requires analysis of environmental justice effects.

This section describes the low-income and minority populations that are located within 1.5 kilometer (1 mile) of the Project Area and Mitigation Areas. Minority populations are defined as when individuals from minority groups comprise more than 50% of the total population of the potentially affected area or when the individuals from minority groups make up a meaningfully greater proportion of the population of the affected area than in the population of the appropriate reference area (e.g., state or county levels). Low-income populations are identified when the income level of at least 20% of the potentially affected population is below the annual statistical poverty thresholds established by the U.S. Census Bureau (CEQ 1997).

Near the proposed Project facilities, there were no areas comprised of over 50% minority population. However, one area in Thurston County, located along the border of Lewis County between Tenino and Centralia has a poverty rate greater than 20% (U.S. Census Bureau 2016). Table 3.17-1 shows the reference minority population levels for the region.

[8] Federal taxes would also apply but are not quantified because the amount is negligible.

Table 3.17-1. Race and Ethnicity by Study Area, Counties, and State

Geographic Area	Total Population	Percent of Total Population					
		Minority Population	White Alone	Black or African-American Alone	Asian Alone	Other	Hispanic or Latino
Washington State	7,073,146	30%	70%	4%	8%	6%	12%
Seattle-Tacoma CSA	4,532,266	32%	68%	5%	11%	7%	10%
Lewis County	75,724	16%	84%	1%	1%	4%	10%
Thurston County	266,311	24%	76%	3%	6%	7%	8%
Pacific County	20,743	17%	83%	0%	2%	6%	9%

Note:
Source: U.S. Census Bureau 2016

Parcels A and B of the conservation lands are not near any areas with over 50% minority population but within a 1.6-kilometer (1-mile) buffer there are some low-income communities. Because the area targeted for the eagle power pole retrofit program spans such a large area and the exact locations of the proposed retrofits are currently unknown, Table 3.17-2 shows the reference populations for low-income populations in the Seattle-Tacoma CSA for context.

Table 3.17-2. Poverty Rate by Study Area, Counties, and State

Geographic Area	Population for Whom Poverty Status Is Determined	Percent of Individuals Below the Poverty Line
Washington State	6,939,622	12.7%
Seattle-Tacoma CSA	4,458,244	11.2%
Lewis County	74,618	16.3%
Thurston County	262,462	12.0%
Pacific County	20,518	18.7%

Note:
Source: U.S. Census Bureau 2016

4 Environmental Consequences

4.1 Introduction

As described in greater detail in Chapter 2, under the Proposed Action and at the request of the Applicant, the Service would issue an ITP to the Applicant for O&M activities only. As further described in Chapter 2, the Project may or may not be constructed prior to the Service's determination to issue the ITP.

For these reasons, the Service has identified and evaluated alternatives in this EIS that focus on different conservation strategies that could be implemented after the completion of construction

to minimize take of the Covered Species. Because the ITP would not cover construction or decommissioning of the Project, the Service has not attempted to identify reasonable alternatives that include conservation strategies that could be implemented prior to construction to minimize take of Covered Species. Nonetheless, construction and decommissioning are considered connected actions as defined in 40 CFR 1508.25. Accordingly, the consequences of these activities are analyzed in this EIS.

With respect to the Proposed Action, the Action Alternatives would authorize differing operational regimes that would result in differing levels of take. Generally speaking, supporting activities, including maintenance, would be the same across the Action Alternatives. This would also be the case with the mitigation required under Section 10(1)(a) of the ESA and the BGEPA (50 CFR 22.26), although the level of mitigation may be lower depending on the extent to which take could be minimized. The analysis of the differences in environmental consequences between the Action Alternatives focused on the impacts that were found to differ according to the best available information. Data quality for non-covered species is coarser than data quality for the Covered Species, so in some cases, the consequences are evaluated more qualitatively.

Because derelict net removal activities and the associated impacts are ongoing and any additional funding would not affect the program implementation, including potential future changes to how they operate, these activities are not expected to result in notable impacts other than with respect to the intended beneficial impacts on wildlife. The Proposed Action would ensure net removal occurs and would be additive to any externally funded net removal, accelerating the pace and thoroughness of this marine conservation program. The following sections address existing resource conditions with the potential to be affected by these activities.

4.2 Geology and Soils

4.2.1 No Action Alternative

4.2.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.1 because the Project facilities would remain standing but would not be operational. The presence of these stationary facilities would result in the exposure of the facilities to existing risks associated with geologic hazards, such as landslides or earthquakes, as described in Section 3.2. More specifically, the transmission line and access road from the WTGs to the O&M facility pass through an area classified as having a moderate to high liquefaction susceptibility. Two WTG locations (T20 and T23) are in areas with a high risk of landslides. Although the existence of the Project would not change the likelihood of landslides, if a landslide occurred, the impact of the landslide may be greater because the facilities could be damaged.

The Project would be required to obtain the appropriate building permits and approvals, which would ensure the facilities are designed to meet the standards set forth by the International Building Code and Thurston and Lewis counties building codes. Compliance would also require appropriate studies and implementation of any mitigation measures needed to ensure the facilities are designed to meet minimum engineering standards and operated in a manner to minimize these risks. Because the Project facilities would be non-operational and located on private lands away from residences and other populated areas, meaning there would be no workers that could be harmed in the unlikely chance of such an event, the potential for impact would be limited to the facility itself.

4.2.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that geology and soils would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.2.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on geology and soils are described in Section 5.3.1.

Once constructed, the Project facilities would present the same geologic hazard risks described in Section 4.2.3. In addition, O&M activities would have limited potential to affect geology and soils in the Project Area. As described in Section 2.3.1, O&M activities entail light traffic to and within the Project Area via access roads to inspect the WTGs and associated support facilities. Repairing or changing out major WTG components may require use of a crane; however, these activities would occur very infrequently and are not expected to result in ground disturbance. O&M activities would introduce workers to the area, putting them at risk if a seismic event were to occur in the Project Area while they were on site. However, this risk is minimal.

Alternative 1 would also result in the implementation of mitigation to offset potential take of the Covered Species, including purchase and maintenance of conservation lands. Although the intention is to halt timber harvest and hold these lands in conservation for the benefit of the species, some amount of enhancement and periodic maintenance and monitoring, such as thinning and interplanting, could occur to promote more suitable nesting habitat. Thinning and interplanting can result in soil compaction and short-term increases in erosion from the use of heavy machinery and the temporary exposure of soil. However, as noted in Chapter 2, while some short-term disturbance would occur, these activities would be conducted only periodically over the course of the 30-year ITP and in a manner approved by the Service, which would include best management practice methods that minimize soil disturbance and any risks of landslides or other issues with slope stability, with a focus on improving natural conditions overall. Because the conservation lands would no longer be subjected to industrial timber

harvest, soil disturbance and landslide risk would be expected to be reduced with less frequent, less intensive forest management. No new types of impacts from funding ongoing derelict net removal are expected because these activities currently occur regardless of the Proposed Action. The Proposed Action would ensure net removal occurs and will be additive to any externally funded net removal, accelerating the pace and thoroughness of this marine conservation program.

Implementation of the eagle power pole retrofit program could also result in very limited ground disturbance if an entire pole was replaced. However, as noted in Chapter 2, the majority of retrofits would likely be to existing poles, and all work would occur within the existing PacifiCorp right-of-way in a manner coordinated with the program contractor, PacifiCorp, and the Applicant and consistent with industry practices to minimize site disturbance. The modifications would not result in changes affecting stability of the existing infrastructure or changes in the risk profile related to seismic events.

4.2.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.1. Once operational, the potential impacts on geology and soils in the Project Area from O&M activities under Alternative 2 would be similar to but slightly less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities that already have a limited potential to affect geology and soils under Alternative 1 would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.2.4 Alternative 3 – Enhanced Curtailment

The potential impacts on geology and soils from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.3 Air Quality

4.3.1 No Action Alternative

4.3.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.2. Under the No Action Alternative, the Project would be non-operational and have no impacts on air quality. Additionally, any benefits related to the production of renewable energy would not occur.

4.3.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that air quality conditions would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.3.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on air quality are described in Section 5.3.2.

O&M activities would result in minor and localized emissions from vehicle travel as workers travel to the O&M facility and within the Project Area. An emergency generator, fueled with natural gas or liquefied petroleum gas, could also infrequently be operated at the O&M facility.

Overall, Alternative 1 is anticipated to have a net benefit with respect to air quality because the Applicant has entered into a power purchase agreement that would make electricity generated by the Project available to utilities and other wholesale energy suppliers for sale to retail electric customers. In so doing, the Project would help utilities meet energy policy objectives to obtain a share of total electricity supplies from renewable energy sources and reduce greenhouse gas emissions associated with energy production.

As noted in Chapter 2, management of the conservation lands is also expected to require activities such as thinning and interplanting to promote more suitable marbled murrelet nesting habitat, but the use of vehicles and equipment would be lower than if these lands remained in industrial timber management. Power pole retrofits would also require use of vehicles and equipment. Both activities would result in minor air quality emissions associated with vehicle and equipment operation; however, these activities would be conducted only periodically over the course of the 30-year ITP and air quality impacts would be minimal compared with the No Action Alternative. Substantial changes in air emissions from derelict net removal are not expected.

4.3.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.2. Once operational, the potential impacts on air quality in the Project Area from O&M activities under Alternative 2 would be slightly lower than Alternative 1 (from no O&M of the five non-operational WTGs) and slightly greater than the No Action Alternative; however, the amount of clean energy offset would also be lower, which would increase the available amount of greenhouse gas generating non-renewable generated electricity. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in air emissions.

4.3.4 Alternative 3 – Enhanced Curtailment

The potential impacts on air quality from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.4 Water Resources

4.4.1 No Action Alternative

4.4.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.3. Option A would have limited potential to adversely affect water resources due to the fact that the facilities would be non-operational. Impervious surfaces associated with the WTG pads would have the potential for increased runoff; however, each area is small and located at the top of the ridgeline, and any runoff would be filtered through vegetation before reaching a receiving water.

4.4.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that water resources would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.4.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not yet constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on water resources are described in Section 5.3.3.

Project O&M activities are expected to have minimal impacts on water resources. As noted in Section 4.4.1, increased areas of impervious surface may result in contaminated runoff that could adversely affect nearby waterways; however, the location of the WTGs and the amount of vegetated cover between the WTGs and receiving water resources greatly reduce this potential for any contaminants to reach a water resource. The potential risks of leaks or spills of fuels or chemicals used for O&M would be greater under Alternative 1; however, O&M activities would not require large volumes of such materials to be stored, transported, or used on a regular basis.

As noted in Chapter 2, management of the conservation lands is also expected to require activities such as thinning and interplanting to promote more suitable marbled murrelet nesting habitat. Power pole retrofits would also require the use of vehicles and equipment. Both activities could result in some level of direct ground disturbance that could increase the potential for erosion or the accidental spill of fuels related to equipment operations; however, these activities would be conducted only periodically over the course of the 30-year ITP. No substantial impacts on water resources are expected from derelict net removal activities.

4.4.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.3. Once operational, the potential impacts on water resources in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.4.4 Alternative 3 – Enhanced Curtailment

The potential impacts to water resources from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in

Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.5 Vegetation and Wetlands

4.5.1 No Action Alternative

4.5.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.4. Under the No Action Alternative, there would be no impacts to wetlands or vegetation. Stationary WTGs may shade underlying vegetation; however, shading caused by Project facilities is not expected to differ substantially from surrounding shade cast by trees and ridgelines to the extent that there would be changes to vegetation.

4.5.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that vegetation and wetlands would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.5.2 Alternative 1 – Habitat Conservation Plan

If the Applicant has not yet constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on vegetation and wetlands are described in Section 5.3.4. Under Alternative 1, O&M activities would have some increased potential to affect vegetation and wetlands in the Project Area compared to the No Action Alternative. Specifically, O&M activities would require light traffic to and within the Project Area that could result in minor increases in dust and the introduction and spread of invasive plants; however, as noted in Section 4.9, worker vehicle traffic would be light and is therefore not expected to result in substantial dust. In rare cases, larger specialized equipment may be required to conduct repair work; however, most equipment would be stored on site and would not be exposed to off-site sources of invasive plant species. All maintenance equipment and vehicles would also be regularly washed and maintained. Further, all work associated with ongoing O&M in the Project Area would occur within existing disturbed areas and would not require new disturbance to or removal of additional vegetation or wetlands.

It is assumed that O&M activities would require that vegetation would be maintained (i.e., mowed) adjacent to roadways, under power lines, in carcass search areas, and under the WTGs. These areas would have been previously disturbed, so this results in these areas being maintained as disturbed grassland habitat throughout the duration of the Project.

Alternative 1 would also result in the acquisition and management of conservation lands to help offset potential take of marbled murrelet. Although the intention is to halt timber harvest and hold these lands in conservation for the benefit of the species, some amount of enhancement and

periodic maintenance and monitoring would be required that could result in minor short-term impacts, such as those that would occur from thinning, which directly impacts both coniferous trees and understory vegetation in the short term. However, these activities would promote old-growth forest structures, improving vegetation conditions overall.

Depending on the extent of power pole modifications, implementation of the eagle power pole retrofit program could also result in localized vegetation disturbance if an entire pole were replaced. However, all work would occur within the existing PacifiCorp right-of-way, which requires vegetation around power poles to be maintained for safety and access purposes, and vegetation is managed throughout the corridor under power lines. Further, all work would be done in a manner coordinated with the program contractor, PacifiCorp, and the Applicant and consistent with industry practices to minimize site disturbance. The modifications would have negligible impacts to surrounding vegetation or wetlands. No impacts from additional derelict net removal are expected.

4.5.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.4. Once operational, the potential impacts on wetlands and vegetation in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities (which already have a limited potential to affect geology and soils under Alternative 1) would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding of derelict net removals would not result in an appreciable difference in impacts.

4.5.4 Alternative 3 – Enhanced Curtailment

The potential impacts on wetland and vegetation from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.6 Fish and Wildlife

The analysis of potential impacts on fish and wildlife species is based on the best available data. Data quality for non-covered species is coarser than data quality for the Covered Species, so in some cases, the consequences are evaluated more qualitatively. For example, the analysis of collision risks uses equal assumptions for collision risk for each WTG except for assessing effects on the Covered Species. Therefore, the discussion describes the potential for effects as proportional to the number of operating WTGs.

4.6.1 No Action Alternative

4.6.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.5. Although the Project would not be operational, the stationary facilities could result in some impacts on wildlife (i.e., avian and bat species) from collisions with stationary structures. Birds are known to collide with anthropogenic structures, including buildings, power lines, and communication towers. A study completed for the United States and Canada estimated total avian fatalities from stationary towers between 60 and 90 meters (196.9 and 295.3 feet) tall (i.e., meteorological towers) and 120 and 150 meters (393.7 and 492.1 feet) tall (i.e., WTGs) caused an estimated 4.3 and 55.1 deaths respectively per structure per year in the United States (Longcore et al. 2012). However, these estimates were for towers both guyed and unguyed with both steady and blinking lights. In their estimates, guyed towers were estimated to cause 85% more fatalities than unguyed towers. Using this assumption and the data provided from that study, unguyed towers were estimated to cause 1.16 and 16.6 fatalities per tower per year for towers between 60 and 90 meters (196.9 and 295.3 feet) tall and 120 and 150 meters (393.7 and 492.1 feet) tall, respectively.

Transmission lines have been estimated to cause 25.2 to 59.4 (an average of 42.3) avian fatalities per kilometer per year (Rioux et al. 2013). These numbers include studies from multiple countries and include birds of all sizes and species, including birds of higher susceptibleness to collision (e.g., larger birds and birds with poor eyesight) (Rioux et al. 2013). Waterfowl tend to have high incidences of collision with power lines, and the installation of bird diverters, particularly near wetlands or other riparian areas, would help minimize collision risks.

On the other hand, bats rarely collide with stationary objects such as meteorological towers (NRC 2007), so mortality caused by non-operational WTGs and transmission lines is expected to be negligible. Because the Project facilities would not be operational, no other impacts associated with the stationary facilities are expected.

4.6.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that fish and wildlife would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.6.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on fish and wildlife are described in Section 5.3.5. In addition, issuance of an ITP would authorize Project O&M activities and require implementation of the minimization and mitigation measures described in Section 2.3.2. O&M of the Project under Alternative 1 has the potential to increase risk of collision with operational WTGs compared to stationary WTGs and result in additional effects related to increased noise and activity in the Project Area.

Although implementation of the mitigation measures would benefit fish and wildlife species in the long term, there is also a potential for some short-term localized disturbance depending on the extent of the proposed activities; however, these effects would be similar to current logging operations during the work period (e.g., noise, air quality) and less impactful to the habitat. In general, Alternative 1 would have a higher potential effect on fish and wildlife than the No Action Alternative, and those effects are described in the following sections. No impacts from funding ongoing derelict net removal are expected.

4.6.2.1 Fish

Though several fish-bearing streams and rivers are located within the Project Area, O&M activities under Alternative 1 are not expected to affect fish populations. There would be no work within or near any waterways, and as noted in Section 4.4, the potential for impacts on water quality is low. Acquisition of conservation lands would ultimately benefit fish populations through conversion from active timber harvest to permanent conservation. However, some streams have a low potential to be affected during enhancement and maintenance activities, such as road construction and selective forest thinning, which may increase the potential for contaminated stormwater runoff in the short term. Implementation of the eagle power pole retrofit program is not expected to affect fish populations, as these areas are rarely located in aquatic or riparian habitat. Derelict net removal would have a positive impact on fish as fish, shellfish, and other marine life become entangled in derelict nets.

4.6.2.2 Birds

As summarized in Section 3.6, passerines make up the majority of the avian observations within the Project Area. Passerines were the dominant species group observed across all seasons and accounted for 66% of species observed during surveys (n = 45 passerine species) (ABR, Inc. 2016). Passerines were the most abundant species group, with 2,968 individuals in

1,777 groups. The four most numerically dominant species all were passerines and included dark-eyed junco (12% of all individuals), American robin (6%), common raven (*Corvus corax*) (6%), and white-crowned sparrows (5%). Given the relatively high mean use of these species in the Project Area and preferred habitat for many passerines, combined with known fatalities at other wind energy facilities, there is high potential for mortality of passerines in association with Project O&M under Alternative 1. Though all of these species are considered common in a variety of habitats in western Washington, the U.S. Geological Survey Patuxent Wildlife Research Center found breeding populations of juncos significantly declining in recent years in the region. Conversely, white-crowned sparrow populations were found to be increasing, while American robin populations were considered stable (Sauer et al. 2017).

"Other birds" comprised the second most abundant species group observed with 265 individuals in 201 groups. Northern flicker (113 individuals in 104 groups), band-tailed pigeon (*Patagioenas fasciata*) (91 individuals in 44 groups), and rufous hummingbird (14 individuals in 4 groups) were the three most abundant species in this group. Northern flickers are also likely to experience some collision-related mortality based on their relative abundance in the area.

Raptors were the third most abundant species group and included a total of 157 individuals in 108 groups. Turkey vulture (*Cathartes aura*) was the most commonly observed raptor (58 individuals in 36 groups), followed by red-tailed hawk (24 individuals in 20 groups). In addition to these two most numerous species, northern harrier, sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), American kestrel (*Falco sparverius*), osprey, peregrine falcon, and northern pygmy owl (*Glaucidium gnoma*) were observed (listed here in order of abundance). Some raptors are expected to experience collision related mortality due to their use of the Project Area.

There are few data directly linking these species' population changes to mortality events at wind energy facilities, perhaps due to a lack of wind facilities in forested areas in the Pacific Northwest. The Hopkins Ridge Wind Project located in Columbia County, Washington, which is in a combination of grassland/shrub-steppe and coniferous zones and different habitat than the Project Area, found a total of 38 avian fatalities during the first year of turbine operation, including a single dark-eyed junco and a single white-crowned sparrow (Young et al. 2007). The Hatchet Ridge Wind Project, a wind energy facility built along a forested ridgeline in northern California, reported 42 passerine fatalities during 2 years of monitoring, including three dark-eyed juncos, one American robin, and one Vaux's swift (Tetra Tech 2013). These numbers are direct counts of birds and do not take into account bias such as searcher efficiency or carcass removal by scavengers.

In a literature review of 217 documents related to wind farms and bird mortality, multiple species characteristics were identified for increasing susceptibility for collisions with WTGs, including eyesight, phenology, general behavior, and abundance (Marques et al. 2014). Project specifics

including location, tower size, blade configuration, and lighting were also cited as causing variability in collision rates. This study also evaluated minimization via curtailment of WTGs during specific times as being successful (e.g., turbine shutdown on demand during risk periods) or having high potential (e.g., restricting operations during migratory periods). In a review of population-level effects of WTG mortality, ducks were the most likely to experience a decline in abundance, followed by seabirds and waders (not including gulls) (Stewart et al. 2005).

Estimates of bird mortality from WTGs range widely due to multiple factors including location, size of towers, species of birds, and study methodology. Estimates of bird mortality at WTGs vary between nearly 0 and more than 30 birds killed per WTG per year, with estimates depending greatly on how mortality is monitored and how monitoring results are corrected for carcasses that were missed (Zimmerling et al. 2013).

Due to a lack of operational wind facilities in similar habitats in the Pacific Northwest, it is difficult to estimate total bird fatality through comparison with similar projects. Similarly, avian avoidance behavior and other indirect impacts of wind facilities (e.g., displacement, breeding performance, adult survival, or changes in predator abundance) associated with wind power development have not been extensively studied in the United States, particularly in forested habitats similar to the Project Area (Smith and Dwyer 2016). Based on the available information, it is probable that some birds avoid turbines.

The National Wind Coordinating Committee estimates 1.9 bird mortalities per turbine per year (2.7 birds per MW per year), based upon data from four wind facilities in operation east of the Cascades (NWCC 2004).

A recent study at known high-fatality areas of the Altamont Pass Wind Resource Area, California, found fatality rates as high as 31.7 birds per year per MW of electric generation capacity (Smallwood and Neher 2017), which for the 137-MW Project proposed here would equate to 4,343 birds per year. This number is likely much higher than the number of birds that would be killed, because it is based on fatalities at known high-fatality areas at a known high-fatality facility.

In a study evaluating mortalities for wind farms across Canada (Zimmerling et al. 2013), estimates of collision mortality among 43 wind farms varied between 0 and 26.9 birds per turbine per year. On average, estimated mortality was 8.2 birds per turbine per year. It is not known how these numbers might compare with the number of fatalities expected at the Skookumchuck facility because of the multiple variables that determine bird fatalities (e.g., time of year, hours of operation, surrounding habitat, position in flyway, and types of bird present in the area).

Because this study was done across many habitats and geographies and applied multiple correction factors to the data, these numbers were used as a basis for comparison purposes for the Skookumchuck facility. That is, estimates were made to provide a way to compare

alternatives based on the assumptions used and are not intended to estimate fatalities specifically for this project. Table 4.6-1 summarizes estimates for bird fatalities using the numbers from Longcore et al. 2012 for stationary towers, Rioux et al. 2013 for transmission lines, and Zimmerling et al. 2013 for WTGs. This analysis assumed that there would be three meteorological towers 67 to 80 meters tall (219.82 to 262.47 feet), 38 WTGs 150 meters (492.13 feet) tall, and a 24.1-kilometer (14.98-mile) transmission line. For the No Action Alternative, all towers, including WTGs, were assumed to be stationary. Therefore, the data from Rioux et al. 2013 were used for unguyed towers. For Alternatives 1, 2, and 3, Alternative 1 was assumed to be running every day, and Alternatives 2 and 3 were run at 87.6% and 86.2% fewer hours per year respectively. While this would skew the numbers higher than actual hours of operation due to weather and other issues (because it isn't clear where this project would fall in relation to the fatality numbers used), these hours of operation were used for alternative comparison purposes and are not intended to represent actual numbers of avian fatalities.

Table 4.6-1. Estimates of Avian Fatalities at Wind Farms Using SWEP Avian Data

	No Action		**Alternative 1**		**Alternative 2**		**Alternative 3**	
Species Group	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Raptors	27.68	94.15	27.84	111.98	27.84	106.21	27.84	100.58
Passerines	523.23	1,779.78	526.23	2,116.99	526.23	1,901.33	526.23	1,901.33
Game Birds	3.53	11.99	3.55	14.27	3.55	12.81	3.55	12.81
Waterbirds	6.17	20.99	6.21	24.96	6.21	23.68	6.21	22.42
Other Birds	46.72	158.91	46.98	189.02	46.98	179.27	46.98	169.76
Total Birds	**607.33**	**2,066.02**	**610.81**	**2,457.22**	**610.81**	**2,223.30**	**610.81**	**2,206.90**

As described in Section 2.3.1, O&M activities entail light traffic to and within the Project Area via access roads to inspect the WTGs and associated support facilities. Ground-dwelling and ground-nesting birds are more susceptible to vehicular collision because they are slow-moving, occur at ground level, and have reduced maneuverability. Vehicle speed restrictions to 1.6 kilometers (25 miles) per hour in the Project Area would help to minimize these risks. Additionally, though general human activity would increase in the Project Area under Alternative 1, it is likely that this would have little to no negative effect on birds that may be present based on the disturbed habitat types present and their acclimation to existing activity. There is additionally some evidence suggesting noise generated from WTGs may disrupt acoustic communication, though both the amount of disruption and the response are likely to be species-specific (Smith and Dwyer 2016).

Alternative 1 would additionally result in the acquisition and management of conservation lands to help offset authorized take of marbled murrelet and bald eagles. The proposed conservation

areas would also benefit other bird populations by providing additional roosting, nesting, and foraging habitat. Though industrial timber harvest would cease on these lands, enhancement activities, such as thinning and interplanting to promote multi-layer forest structure, would take place along with periodic maintenance and monitoring. Such activities would potentially disrupt avian populations in the short term through increased human activity, noise, and vehicular traffic. However, over the course of the 30-year project duration, bird populations are expected to benefit. Removal of derelict fishing nets, which would be funded for a period of time under Alternative 1, would also benefit all species of seabirds, such as loons (*Gaviidae* spp.), auks (*Alcidae* spp.), gulls (*Laridae* spp.), pelicans (*Pelecanidae* spp.), cormorants (*Phalacrocoracidae* spp.), and grebes (*Podicipedidae* spp.).

Implementation of the eagle power pole retrofit program would similarly benefit other raptor populations that may be susceptible to electrocution. Activities associated with retrofitting or replacing power poles may cause minor disturbance during construction but overall are not expected to adversely affect birds.

4.6.2.3 Bats

Under Alternative 1, some bat mortality is expected due largely to collision with operational WTGs. Collisions with stationary objects (i.e., non-moving WTGs, meteorological towers, and transmission lines) are considered negligible and are not discussed further. Bat collisions and fatalities at wind facilities have been well documented, with migratory tree bats accounting for some of the highest mortality rates at wind facilities (Arnett et al. 2008; Kunz et al. 2007). These species migrate long distances at altitudes similar to WTG blades, increasing the risk of collision (Arnett et al. 2008). Such species include the silver-haired and hoary bats, which make up the majority of bats identified in the Project Area (ABR, Inc. 2016). In Washington and Oregon, activity and fatalities typically peak between mid-August and September, corresponding with peak migration timing (Kerlinger et al. 2006). Other forms of harm or harassment from activities such as noise, lighting, or vibration are unlikely as studies have documented regular bat foraging and activity in the vicinity of operating turbines (Cryan et al. 2014).

In more recent studies, bat mortality has been calculated to range from 17.2 to 29.6 in Europe (Korner-Nievergelt et al. 2013) and from 0 to 103 in Canada (Zimmerling and Francis 2016) per WTG annually. The study in Europe was based on 30 wind turbines in 15 facilities in Germany. The study from Canada used data from 64 wind farms across Canada. Similar to the issues with birds, it is difficult to determine where this project would fit into the range due to the multiple variables involved in individual wind farms that affect mortality rates (e.g., adjacent habitat, weather, and species present). For purposes of comparing alternatives, the upper limit from the Canadian study was used and applied to the data obtained from the bat surveys for the Project Area. These numbers assumed that Alternative 1 would be active 365 days a year, which is not proposed or realistic. Therefore, the numbers likely estimate the fatalities as higher than would

be expected, but they likely capture the number of fatalities that may occur and represent a way to compare the alternatives. Table 4.6-2 summarizes the results of this analysis.

Table 4.6-2. Estimates of Bat Fatalities at Wind Farms Using SWEP Bat Data

Species	Alternative 1	Alternative 2	Alternative 3
Silver-Haired Bat	2,803.89	2,456.21	2,416.95
Hoary Bat	486.39	426.08	419.27
Big Brown Bat	223.17	195.49	192.37
Little Brown Bat	188.83	165.42	162.77
California Bat	91.56	80.20	78.92
Long-Eared Bat	57.22	50.13	49.33
Yuma Bat	40.06	35.09	34.53
Fringed Bat	11.44	10.03	9.87
Long-Legged Bat	5.72	5.01	4.93
Townsend's Big-Eared Bat	5.72	5.01	4.93
Total Bats	**3,914.00**	**3,428.67**	**3,373.87**

As described in Section 2.3.1, O&M activities entail light traffic to and within the Project Area via access roads to inspect the WTGs and associated support facilities. Though bats may collide with vehicles, such collisions are expected to have negligible impacts on bat populations in the Project Area, based upon infrequent vehicle traffic and vehicle speed restrictions to 1.6 kilometers (25 miles) per hour. Additionally, though general human activity would increase in the Project Area under Alternative 1, there is evidence this would have little to no negative effect on bats that may be present (Garcia-Morales et al. 2013).

Alternative 1 would also result in the acquisition and management of conservation lands to help offset authorized take of marbled murrelet. The proposed conservation areas would also benefit migratory and resident bat populations by providing commuting and foraging habitat. Though second-generation and younger forests predominate these areas currently, providing little bat roosting habitat, the intention is to halt timber harvest and hold these lands in conservation, generating larger roost trees in the process. Some amount of enhancement and periodic maintenance and monitoring would be required on conservation lands, including thinning and interplanting to promote the development of an old-growth multilayer forest structure. However, bat populations would likely benefit if clearings are enhanced, and they are not likely to be disturbed by human activity in the area (Garcia-Morales et al. 2013). Implementation of the eagle power pole retrofit program is not expected to affect bat populations, as all work would occur within the existing human-altered areas in the PacifiCorp right-of-way.

4.6.2.4 Mammals

Though knowledge is generally sparse regarding the effects of wind power on terrestrial mammals, it is likely mammals would be affected in various ways under Alternative 1. Potential impacts from O&M include increased exposure to noise, human activity, and the risk of mortality from vehicle traffic (Lopucki et al. 2017).

The noises generated through project O&M activities (namely operational WTGs) may affect mammals by disrupting vocal communication or impairing the ability to hear predators (Helldin et al. 2012); however, very few studies have directly considered these potential effects. Two types of noise are produced at wind energy facilities: the first from the turbine machinery inside the nacelle and the second from the blades moving through the air. Additionally, a low-frequency infrasound, below the human audible range, may be generated as turbulence and the tower structure interact (Lovich and Ennen 2013). However, the noise levels directly under a WTG have been calculated well below those inducing stress responses in domesticated animals (Helldin et al. 2012), and habitat use directly under WTGs may indicate mammals such as elk and other ungulates may habituate to the noises quickly (Helldin et al. 2012; Walter et al. 2006). Therefore, the impact of WTG noise on mammals' well-being is expected to be limited.

O&M activities would also entail light traffic to and within the Project Area via access roads to inspect the WTGs and associated support facilities, as described in Section 2.3.1. Increased vehicular traffic may negatively affect a variety of mammals within the Project Area. Small mammals may find enhanced habitat along road edges, but additional traffic associated with Alternative 1 would increase the likelihood of collisions with vehicles. Similarly, large predatory mammals (such as mountain lion, bobcat, and coyote) would be at higher risk for collisions, as these animals may be attracted to hunt small mammals along the road or scavenge bird and bat carcasses associated with WTG collisions (Lovich and Ennen 2013). However, given the infrequent vehicle traffic and vehicle speed restrictions to 1.6 kilometers (25 miles) per hour, the impacts on mammals would most likely be minimal.

Alternative 1 would result in the acquisition and management of conservation lands to help offset authorized take of marbled murrelet. The proposed conservation areas would also benefit mammals by preventing further habitat fragmentation, protecting riparian areas, and providing a more mature forest habitat. Furthermore, the strategies required to enhance and maintain the conservation lands to achieve old-growth forest structures are similar to strategies suggested to enhance Willapa Hills elk habitat, along with all mammals associated with older, mature forests, and include reducing coniferous density and maintaining stands for a longer period of time (WDFW 2014). Though enhancement and maintenance activities could temporarily disrupt mammals in the area through increased noise, traffic, and exposure to humans, many species are expected to benefit in the long term by increasing a habitat type that has been greatly reduced. Similarly, implementation of the eagle power pole retrofit program is not expected to affect

mammal populations, as all work would occur within the existing human-altered areas in the PacifiCorp right-of-way.

Removal of derelict fishing nets, which would be funded for a period of time under Alternative 1, would benefit a variety of marine mammals including whales and porpoises (Cetacea spp.), seals (*Phocidae* spp.), sea lions (*Otariidae* spp.), and most other marine life.

4.6.2.5 Reptiles and Amphibians

No significant impacts on reptile and amphibian species are expected to occur associated with the Project O&M activities under Alternative 1. Though activities may occasionally result in a vehicle strike, this is expected to be a rare occurrence due to the limited nature of traffic expected within the Project Area. Acquisition of the conservation lands would further benefit reptile and amphibian populations by reducing habitat fragmentation and protecting riparian areas. Implementation of the eagle power pole retrofit program is not expected to affect reptiles and amphibians because the proposed activities would not require extensive disturbance to the areas surrounding each power pole, as described in Section 2.3.

4.6.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.5. The risk of collision for birds and bats is proportionally dependent on the amount of exposure to functioning turbines. Therefore, this risk decreases when turbine operation is curtailed or when the blade angle is adjusted to decrease the chance for a strike. Once operational, Alternative 2 would result in a slightly lower risk of collisions for bird and bat populations compared to Alternative 1. This is because the five WTGs closest to documented marbled murrelet nest locations (T34 through T38) would not operate at all under Alternative 2, and a reduction in total bird and bat mortality would be expected for those WTGs not in operation over the duration of the ITP (NWCC 2004).

The potential impacts in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding of derelict net removals would decrease the take of fish, seabirds, and marine mammals proportionately.

4.6.4 Alternative 3 – Enhanced Curtailment

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.5. Once operational, under Alternative 3, curtailment would be applied to all 38 WTGs and would be in effect each year from April 1 to September 30. The daily curtailment period would begin 2 hours before sunrise and end 2 hours after sunrise, and the dusk curtailment period would begin 2 hours before sunset and end 1 hour after sunset. Such curtailment would result in lower total bird and bat mortality over the duration of the Project compared to Alternatives 1 and 2. Because the total operating hours are slightly less for Alternative 3 than Alternative 2, there would likely be slightly less total mortality under Alternative 3 than 2, and both would be less than Alternative 1. The reduction in mortality for Alternative 3 may be greater than this because the curtailment season under this strategy overlaps with the migration timing of many bird and bat species, which account for the majority of WTG collision fatalities (Arnett et al. 2008; Erickson et al. 2005). Alternative 3 also includes implementation of IdentiFlight technology, which is expected to further help minimize the potential for impacts on large raptors, including eagles, vultures, goshawks, red-tailed hawks, and other resident and migratory birds.

In general, the potential impacts from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. The potential impacts associated with mitigation would be the same as for Alternative 2. This is because the amount of bald and golden eagle mitigation would be the same. There would be even lower take of marbled murrelet, which would likely require a lower level of mitigation and fewer related impacts.

4.7 Rare, Threatened, and Endangered Species

4.7.1 No Action Alternative

4.7.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.6. Although the Project would not be operational, it is expected that the No Action Alternative could result in some impacts mainly affecting avian and possibly bat species from collisions with stationary Project structures. As discussed in greater detail in Section 4.7.2, two models, one for marbled murrelets and one for bald and golden eagles, were used to aid in the prediction of collision-related fatalities for the Covered Species. Information about these models is presented in Appendix C.

Although the leading cause of mortality for marbled murrelets is predation of young at nests (Hamer and Nelson 1995), anecdotal evidence suggests that collision with stationary and moving objects also results in mortality. The potential for marbled murrelets to collide with

non-operational WTGs over the 30-year analysis period can be quantified by modifying inputs into the model that was developed by the Applicant in coordination with the Service to estimate take under Alternative 1. Although it is less likely that marbled murrelets (and birds in general) would strike a non-moving WTG, the chance is not zero. The model predicts that an average of 0.501 adult marbled murrelets per year, or 15 murrelets over the course of 30 years, will be killed due to collisions with stationary turbines. Additionally, risk of collision associated with other features, such as the transmission line, are also unlikely. This is because the marbled murrelets would usually travel through the Project Area at a height greater than the line, which is expected to be no more than 35.05 meters (115 feet), and because there is limited suitable habitat or flight corridors near the line. However, any collision-related mortalities would be considered take under the ESA, and the risks of violating the ESA would be borne by the Applicant.

Any loss of an adult bird during the breeding season would have the potential to result in secondary or indirect impacts related to the possibility that an active nest may become abandoned and future chicks would not be able to contribute to population increases over time. The loss of 15 adults over 30 years would result in the loss of approximately 2 adult equivalents (i.e., chicks expected to survive to adulthood), plus all future reproduction of those 30 adults and 2 adult equivalents. As noted in greater detail in Section 4.22.2, the marbled murrelet species is in decline due to a variety of factors, and any additional losses would contribute to this status.

As discussed in greater detail in Section 4.7.2.2, the Service has developed a collision risk model (CRM) as part of the ECPG (Service 2013) to aid in the assessment of potential collision-related fatalities from WTGs. The model assumes that stationary WTGs do not present risks to eagles, and therefore the risks to eagles associated with the No Action Alternative cannot be quantified; however, despite the assumptions in the CRM, there does remain a low chance that eagles may strike Project features, such as stationary WTGs and the transmission line. Similar to the potential risks associated with impacts on marbled murrelets, the Applicant would be responsible for any eagle take that may occur, which would be considered in violation of the BGEPA.

Other relatively rare species that are known to occur in the Project Area, such as pileated woodpecker, Vaux's swift, northern goshawk, and Townsend's big-eared bat, may also be affected as the result of increased risk of striking stationary Project features. As noted in Section 4.6.1, this risk is much lower compared to that of operational WTGs and is not expected to substantially affect bat species.

4.7.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that rare, threatened, and endangered species would continue to be affected in a manner similar to existing conditions as described in Chapter 3.

4.7.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on rare, threatened, and endangered species are described in Section 5.3.6.

Covered Activities would also have the potential for adverse impacts on rare, threatened, and endangered species, including the potential for take of Covered Species. This is mainly due to increased risks associated with operational WTGs, although some additional impacts related to general O&M may also occur.

For example, risk of collision associated with other features, such as the transmission line or meteorological towers, may occur but are unlikely. With respect to marbled murrelets, this is because birds would usually travel through the Project Area at a height greater than the line, which is expected to be no more than 35.05 meters (115 feet), and because there is limited suitable habitat or flight corridors near the line. However, any collision-related mortalities would be considered take under the ESA, and the risks of violating the ESA would be borne by the Applicant.

With respect to eagles, the Service has developed a CRM as part of the ECPG (Service 2013) to aid in the assessment of potential collision-related fatalities from WTGs. The model assumes that stationary WTGs do not present risks to eagles, and therefore the risks to eagles cannot be quantified; however, despite the assumptions in the CRM, there does remain a low chance that eagles may strike Project features, such as the transmission line and meteorological towers. Similar to the potential risks associated with impacts on marbled murrelets, the Applicant would be responsible for any eagle take that may occur, which would be considered in violation of the BGEPA.

Although the potential for impacts would increase, compared to the No Action Alternative, the risks would be minimized and mitigated consistent with Section 10(2)(a) of the ESA through implementation of the Applicant's HCP.

In addition to describing the methods and estimated potential for take of the Covered Species, this section also describes the potential for impacts on any rare, threatened, and endangered species likely to occur within the Project Area from displacement, increased noise, and increased human activity. The benefits anticipated from implementation of the minimization and mitigation measures that would be implemented to minimize the potential for take are also discussed. The implications of the Action Alternatives on the Covered Species population status are addressed in Section 4.22.

4.7.2.1 Marbled Murrelets

4.7.2.1.1 Collision-Related Mortality

For the purposes of assessing the potential for take associated with Alternative 1, a marbled murrelet collision model was developed in coordination with the Service and Applicant. The model was based on one previously developed for an earlier stage of the Project (ABR, Inc. 2015) and modified to account for updates relevant to the Project in coordination with the Service. The approach and results of the updated model (Chambers Group and WEST 2019) are summarized in Appendix C, with additional detail presented in Chapter 7 and Appendix D of the HCP.

Assuming full operation of the Project without any curtailment, the model found that up to 2.5 fatalities per year would occur. This would result in up to 75 direct marbled murrelet fatalities from collisions over the course of the 30-year ITP. The take of an adult murrelet due to collision with a wind turbine may also lead to the indirect loss of an egg or nestling if that adult is actively breeding because the remaining adult of the pair will not be able to maintain the nest. As discussed further in Chapter 5 of the HCP, the Applicant estimates this effect to result in the potential equivalent loss of 0.33 2-year-old marbled murrelets per year or approximately 9.9 adult equivalents over the 30-year ITP. The total predicted take associated with operation of the Project is 75 adults and 10 adult equivalents.

The Applicant proposes to purchase and maintain two parcels in Pacific County and fund derelict net removal in the Salish Sea for the benefit of the species. The conservation lands would be expected to contribute 15 to 30 adult equivalents to the population, with net removals preventing mortality of 53 adults and 3 adult equivalents over the 30-year ITP. With an optimistic view of the contribution of the conservation lands, the mitigation actions would be expected to augment the marbled murrelet population by the equivalent of 86 reproductive adults. Although there is uncertainty as to whether this level of benefit could be achieved in 30 years, the mitigation activities would confer additional benefits that have not been quantified. The conservation lands are located in an area where conservation of privately owned forest land is very important to the distribution of marbled murrelets, due to the proximity to marine foraging areas, lack of nearby federally managed land, and high historical usage of nearby areas by nesting marbled murrelets. The conservation lands would be protected in perpetuity and would continue contributing marbled murrelets to the population. In addition, removal of nets from marine foraging areas would prevent the death of marbled murrelets for the entire time the nets would otherwise remain in the water entangling marine animals, not only for the 30-year permit term. Both proposals are summarized in Chapter 2 and discussed in greater detail in Chapter 6 of the HCP. The Applicant has estimated the benefits of the proposed mitigation would fully offset the requested level of take. Additional information relative to calculations presented herein can be found in Chapter 6 of the HCP.

To minimize the potential for take, under Alternative 1 the Applicant would implement the minimization measures described in Section 2.3.2, which include (among other commitments) curtailment of 10 WTGs on a seasonal basis. At this level of curtailment, maximum predicted take would drop to 2.17 adults per year for a total of 65 marbled murrelets over the 30-year term of the ITP. Correspondingly, the number of adult equivalents that would be lost from the population would be reduced to nine. There is some uncertainty as to the effectiveness of this level of curtailment. Because not all turbines will be curtailed and curtailment will only occur during a portion of the breeding season, the effectiveness of the minimization hinges on selecting the turbines and seasons that post the highest risk to marbled murrelets. This is difficult to do with confidence given the existing data. To account for this uncertainty, the Applicant is seeking authorization to take up to 75 adults, or an average of 2.5 murrelets per year, plus indirect effects of the take (10 adult equivalents), for a total of 85 adult equivalents over the course of the 30-year ITP.

4.7.2.1.2 Critical Habitat

The Project is not within designated marbled murrelet critical habitat (Figure 1.1-1), and no changes are proposed to critical habitat.

4.7.2.1.3 Impacts from Other O&M Activities

In addition to the predicted impacts of collision-related fatalities, increased activity from Project O&M has the potential to adversely affect the species. More specifically, there is expected to be some level of behavioral avoidance of the WTGs that are in the flight path of marbled murrelets. Continued avoidance of the area could lead to displacement effects (Petersen et al. 2006). Such displacement effects result in adverse effects because birds may avoid habitat areas beyond the footprint of the facilities, resulting in effective loss of nesting habitat. In a study from Welcker and Nehls (2016), birds of the family *Alcidae*, which includes marbled murrelets, showed avoidance behavior due to an offshore wind farm. Although these effects have not been looked at specifically for land-based facilities, it is possible that birds may fly farther away to nest due to the presence of wind facilities. This type of displacement effect is most likely for the birds nesting closest to the Project Area, approximately 0.64 kilometers (0.4 miles) from the southeasternmost WTGs.

As noted in Section 3.6, other impacts related to increased human activity in the Project Area could occur compared to the No Action Alternative; however, these impacts are expected to be minimal because those activities would not be particularly loud or extensive, the level of traffic is low, and marbled murrelets would mostly likely be exposed to these activities only very briefly while flying over the Project Area.

4.7.2.2 Bald Eagles and Golden Eagles

4.7.2.2.1 Collision-Related Mortality

Bald eagles and golden eagles are also known to be susceptible to wind turbine collisions (Service 2013) and the risks of collision would increase under Alternative 1 compared to the No Action Alternative. Excluding the Altamont Pass Wind Resource Area, where eagle mortalities are exceptionally high, six bald eagle fatalities and 79 golden eagle fatalities were reported from operational wind projects in the United States from 1997 to June 2012 (Pagel et al. 2013). The Service is planning an update to this paper soon, which is expected to include many more confirmed records of bald eagle fatalities at wind projects.

For the purposes of assessing take of bald and golden eagles under Alternative 1, the Service ran a Bayesian CRM (described in the ECPG). The CRM predicts annual eagle fatalities that would occur during operations by defining the relationship between eagle exposure, collision probability, and fatalities and accounting for uncertainty. The model parameters and specific inputs for the Project are discussed in detail in Appendix C, Section 2.4, Figures C-2 and C-3. To ensure that take was not under-predicted, the take prediction for each alternative was taken at the 80th quantile of the resulting probability distribution of predicted annual fatalities. That resulted in predicted annual fatalities of 4.86 for bald eagles and 1.65 for golden eagles.

To minimize the potential take of bald and golden eagles, the Applicant would implement the minimization measures described in Section 2.3, including the use of IdentiFlight. As described in greater detail in Chapter 6 of the HCP, the use of this technology would help to minimize the potential for eagle take related to Project O&M.

To offset the predicted take from project operation, the Applicant proposes to implement a power pole replacement/modification program. Power poles are known to electrocute eagles, and the Service has developed an REA to estimate the number of power pole retrofits necessary to offset the take of eagles at wind energy developments (Service 2013). The REA calculates an impact on the eagle population (debit), expressed in bird-years, and the number of high-risk power pole retrofits (credit) necessary to offset the impact. Details regarding the REA are provided in Appendix G of the ECPG. The eagle power pole replacement program would be implemented consistent with these requirements, resulting in the commitment to retrofit high-risk poles (to golden eagles) within the first 5 years of Project O&M. The need for additional mitigation for golden eagles would be determined in coordination with the Service in 5-year increments based on the results of the compliance monitoring described in Section 2.3.3.1. Power pole retrofits will be targeted to offset take of golden eagles; relative to benefits of power pole retrofit to golden eagles, there will be a smaller benefit to bald eagles from this mitigation as well. Additionally, acquisition of the conservation lands will be managed specifically to benefit

marbled murrelet and is also likely to provide benefits to bald eagles as described in greater detail in Chapter 6 of the HCP.

4.7.2.2.2 Impacts from Other O&M Activities

As noted in Section 3.6, other impacts related to increased human activity in the Project Area could occur compared to the No Action Alternative; however, these impacts are expected to be minimal because those activities would not be particularly loud or extensive and the level of traffic is low.

4.7.2.3 Other Special-Status Species

Section 3.7 identifies three state candidate bird species and one candidate bat species with potential to occur in the Project and Mitigation Areas: pileated woodpecker, Vaux's swift, northern goshawk, and Townsend's big-eared bat.

4.7.2.3.1 Collision-Related Mortality

In all the Action Alternatives, the areas adjacent to the standing turbines would be managed to deter wildlife from seeking habitat or resources in areas where collision could occur. Therefore, collision-related mortality impacts on pileated woodpecker, Vaux's swift, northern goshawk, and Townsend's big-eared bat are expected to be similar to those described in Sections 4.6.2.2 and 4.6.2.3.

4.7.2.3.2 Impacts from Other O&M Activities

Potential impacts to birds and bats from O&M activities are expected to be similar to those described in Sections 4.6.2.2 and 4.6.2.3.

4.7.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.6. Once operational, as described in Section 2.4, under Alternative 2, the Service would issue an ITP authorizing a lower level of take than what is requested by the Applicant. This is because Alternative 2 assumes that five of the WTGs would not operate over the course of the 30-year ITP, resulting in about 88% of the energy production capacity than would otherwise occur under Alternative 1.

Based on additional runs of the models with modifications made to alter the Project site design under Alternative 2, predicted fatalities for marbled murrelet decrease to 1.93 adults per year (compared to 2.496 without curtailment and 2.17 with curtailment under Alternative 1), or 55 adults total. Note that the model may overestimate marbled murrelet fatalities for this alternative because the model does not fully account for the fact that the WTGs permanently curtailed in this alternative also have the highest marbled murrelet passage rate. In addition, indirect effects

resulting from the loss of active nests would lead to the loss of approximately eight adult equivalents (compared to 10 without curtailment and nine with curtailment under Alternative 1).

Under Alternative 2, bald eagle fatalities were predicted to decrease to 4.22 per year compared to 4.86 per year under Alternative 1, and golden eagle fatalities were predicted at 1.43 per year under Alternative 2 compared to 1.65 under Alternative 1 (Appendix C, Section 2.4, Figures C-4 and C-5).

This alternative would result in a reduction in energy production from not operating five WTGs; however, it is generally expected that the type and levels of O&M activities would be similar to those described under Alternative 1.

If marbled murrelets respond to concentrations of WTGs with large-scale avoidance, displacement effects would be less severe under Alternative 2 than under Alternative 1, because operational WTGs are located farther away from nesting habitat. Therefore, there is less risk of nesting habitat becoming effectively unsuitable because of its proximity to operational WTGs or of marbled murrelets having to fly farther to reach their nesting habitat while avoiding operational WTGs.

Similar to Alternative 1, issuance of an ITP under Alternative 2 would require implementation of mitigation to offset the potential for take. Mitigation would be required and implemented for all covered species and would be similar to but slightly less than what is being proposed under Alternative 1. With respect to marbled murrelets, fewer net removals would occur, and with respect to bald and golden eagles, fewer high-risk power poles would need to be replaced.

4.7.4 Alternative 3 – Enhanced Curtailment

Under Alternative 3, operating capacity at the Project would be further reduced to approximately 86% of the levels proposed by the Applicant under Alternative 1. These reductions would occur because Alternative 3 would curtail operations by restricting WTG operations two times per day during an expanded season from April 1 through September 30. Although the seasonal adjustments included in the HCP collision model imply that there are no evening flights before July 1 or after August 9, this is a generalization that was used for the purposes of making a simple model, not a true reflection of marbled murrelet nesting season. It is expected that evening flights occur whenever adults are provisioning chicks, which can occur between May and September (Service 2012b). Therefore, a longer time frame for curtailment would minimize collision risks not only for marbled murrelets nesting during the middle of the breeding season but also for those nesting early or late.

Based on refinements to the marbled murrelet collision model to account for these changes, the estimated number of collision-related fatalities for marbled murrelet would decrease to 1.257, compared to 2.496 without curtailment and 2.17 with curtailment under Alternative 1. Similar to Alternative 2, the indirect effects on the species would also be slightly reduced. Indirect effects

resulting from the loss of active nests would lead to the loss of approximately five adult equivalents (compared to 10 without curtailment and nine with curtailment under Alternative 1).

The eagle CRM also predicts a decrease in the number of bald and golden eagles that would be affected compared to Alternative 1; however, the decrease is greater than what would occur for bald eagles and less than what would occur for golden eagles compared to Alternative 2 (Appendix C, Section 2.4, Figures C-6 and C-7). A comparison of collision-related eagle fatalities under Alternatives 1, 2, and 3 is included in Table 4.7-1.

Table 4.7-1. Comparative O&M Collision-Related Eagle Fatalities by Alternative

Species	Number of Collision-Related Fatalities per Year (Number of Collision-Related Fatalities for 30-Year O&M)		
	Alternative 1	**Alternative 2**	**Alternative 3**
Bald Eagle	4.86 (146)	4.22 (127)	4.12 (124)
Golden Eagle	1.65 (50)	1.43 (43)	1.51 (45)

However, these rates are likely to be further reduced because Alternative 3 also presumes the Applicant would implement IdentiFlight technology, which would help to further minimize the potential for eagle strikes (although at this time a reduction in the take prediction from the implementation of this technology cannot be quantified).

Under this alternative, it is expected that the potential for impacts related to O&M activities would generally be the same as those described under Alternative 1.

With respect to large-scale avoidance of the Project Area and nearby nesting habitat, it is not clear whether this alternative would be more similar to Alternative 1 or Alternative 2.

Similar to Alternatives 1 and 2, issuance of an ITP under Alternative 3 would require implementation of mitigation to offset take. It is expected that the mitigation that would be implemented would be similar to but slightly less than what is being proposed under Alternatives 1 and 2. For marbled murrelets, even fewer net removals would occur. With respect to bald and golden eagles, fewer power pole retrofits would be required.

4.8 Land Use and Recreation

4.8.1 No Action Alternative

4.8.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.7. Although the Project would not be operational, it is expected the Applicant would maintain the lease of the Project Area, even though the Project would not operate, and that the surrounding area would likely remain in active timberland during this time. It is assumed that permitted recreational access in the surrounding lands owned by Weyerhaeuser would continue, but access within the Project Area would be limited. Public recreational areas from which the WTGs may be visible are located primarily to the north, west, and south of the Project. With the exception of elevated ridge tops, most visitors to the Gifford Pinchot National Forest would not be able to see the Project facilities, and no impacts on recreation would be likely.

4.8.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that land use and recreation would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.8.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on land use and recreation are described in Section 5.3.7. O&M activities would not result in additional impacts on land use or recreation compared to the No Action Alternative. Although the Project facilities would be operational resulting in increased activity in the Project Area, the activities would be consistent with the surrounding timberlands and are not expected to cause any changes to surrounding land uses or adverse effects on recreational opportunities. As discussed in Section 4.11, noise emissions from the WTGs is expected to attenuate to less than 35 A-weighted decibels (dBA) within approximately 0.8 kilometer (0.5 mile) of the location of the WTGs and should not disturb land or recreational uses near the Project Area.

Alternative 1 would also include acquisition and management of conservation lands. This would convert the land use from active private timber harvest to a permanent conservation to promote old-growth forest habitat. This exchange of ownership is not expected to result in impacts on the surrounding land uses, although any private recreational access currently allowed is not likely to be permitted.

Implementation of the eagle power pole retrofit program under Alternative 1 would be unlikely to affect land use and recreation compared to the No Action Alternative. Power pole retrofitting is proposed to occur in an area within the existing power pole infrastructure, which occurs on

private and public lands and encompasses a diverse array of land uses. No impacts from funding ongoing derelict net removal are expected.

4.8.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.7. Once operational, the potential impacts on land use and recreation in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. There would also be less take of marbled murrelet, which could result in a lower level of mitigation.

4.8.4 Alternative 3 – Enhanced Curtailment

The potential impacts land use and recreation from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.9 Visual Resources

4.9.1 No Action Alternative

4.9.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.8. Although the Project would not be operational, it is assumed that the Project has been built but would not be operational and would therefore have limited potential to affect visual resources over the course of the 30-year analysis period. Because the Project facilities would be in place but not operational, the No Action Alternative would not result in activities or changes to the facilities that would affect visual resources.

4.9.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that visual resources would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.9.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on visual resources are described in Section 5.3.8. Project operations would also have the potential to result in visual changes associated with turning turbines (such as shadow flicker) and safe operations (such as increased lighting). Shadow flicker occurs when the blades of a turbine pass in front of the sun to create a recurring shadow on an object within close range (estimated at approximately 1,000 to 1,500 meters [3,280.4 to 4,921.3 feet] in distance) from the WTG. Under certain circumstances, this causes a "strobe light" effect that may be a nuisance for nearby properties and can even induce stress and seizures if improperly sited. Because the field of effect would be limited to the general vicinity of each WTGs, this would not be visible to area residents.

Low-intensity, blinking red lights would also be operating on the exterior of 26 WTGs to comply with FAA safety requirements. These lights will be red and would not be a substantial source of bright lighting or glare.

Implementation of the conservation strategies required by the ITP under Alternative 1 would also have limited potential for visual impacts. Within the conservation lands, and especially in Parcel B, which is located alongside and visible from U.S. Highway 101, there may be some visual changes related to thinning. However, these impacts would likely be less than the visual impacts of the current industrial forestry practices, and allowing the lands to return to old-growth conditions is expected to result in beneficial impacts to visual resources. The eagle power pole retrofit program would require some short-term construction activities that are likely to last only a few days at most and would be similar to current maintenance activities for the existing infrastructure. The changes are also not expected to result in any substantial changes to the infrastructure that would cause visual impacts in the long term. No impacts from funding ongoing derelict net removal are expected.

4.9.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.8. Once operational, the potential impacts on visual resources in the Project Area from O&M activities under Alternative 2 would be slightly lower than Alternative 1 (from no O&M of the five non-operational WTGs) and slightly greater than the No Action Alternative; however, the amount of clean energy offset would also be lower, which would increase the demand on greenhouse gas-generating non-renewable generated electricity. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller

portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.9.4 Alternative 3 – Enhanced Curtailment

The potential impacts on visual resources from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.10 Cultural and Historic Resources

In addition to NEPA requirements to evaluate to cultural resources, Section 106 of the National Historic Preservation Act requires that federal agencies consider the effects of their undertakings (including funding, licensing, or permitting the undertakings of other entities) on historic properties. A historic property is a prehistoric or historic district, site, structure, or object that is eligible for listing on the NRHP. In assessing effects, agencies must consult with the Advisory Council on Historic Preservation, the Washington State Historic Preservation Officer, Native American tribes, and the public.

The issuance of an ITP and the Applicant's Covered Activities described in the HCP under the Service's direct jurisdiction constitute an undertaking under Section 106 of the National Historic Preservation Act. Individuals and organizations identified as potential consulting parties were contacted to provide them with information about the proposed Project and to seek additional input regarding the identification and evaluation of archaeological and historic resources.

4.10.1 No Action Alternative

4.10.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.9. Because the Project would not be operational, there would be no potential to result in impacts on cultural or historic resources.

4.10.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, it is expected that cultural and historic resources would likely remain similar to what is described in Chapter 3 over the 30-year analysis period.

4.10.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of

construction and decommissioning on cultural and historic resources are described in Section 5.3.9. O&M activities would have limited potential to affect potential historic resources because these activities would involve maintenance of existing non-historic infrastructure. O&M activities are not expected to result in disturbance of previously undisturbed areas where intact archaeological materials may be present, nor are they expected to impact any structures older than 50 years.

Acquisition and management of the conservation lands would have a low potential to affect historic properties because the lands would be held in conservation. Most lands would be left to mature undisturbed, and activities that may occur to enhance habitat for the Covered Species would be limited.

The eagle power pole retrofit program would also have low potential to affect historic properties. Installing eagle-proof installation on existing poles does not require ground disturbance and would not affect structures older than 50 years. Some power poles may be replaced, requiring ground disturbance. However, this would likely occur within the footprint of previous disturbance caused by the installation of the existing infrastructure. No impacts from derelict net removal are expected.

4.10.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.9. Once operational, the potential for impacts on cultural and historic resources in the Project Area would be the same as for Alternative 1 and the No Action Alternative, because differences in the operation of the WTGs would not alter the potential to affect cultural resources. The potential for impacts from mitigation would be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.10.4 Alternative 3 – Enhanced Curtailment

The potential impacts on cultural and historic resources in the Project Area from Alternative 3 would be the same as for Alternative 1 and the No Action Alternative because differences in the operation of the WTGs would not alter the potential to affect cultural resources. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.11 Tribal Resources

4.11.1 No Action Alternative

4.11.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.10. Once constructed, because the Project would not be operational, there would be no potential to result in ongoing impacts on tribal resources over the course of the 30-year analysis period.

4.11.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no impacts on tribal resources.

4.11.2 Alternative 1 – Habitat Conservation Plan

As noted in Section 3.11, no tribal resources have been identified within the study area.

4.11.3 Alternative 2 – Modified Project Site Design

As noted in Section 3.11, no tribal resources have been identified within the study area.

4.11.4 Alternative 3 – Enhanced Curtailment

As noted in Section 3.11, no tribal resources have been identified within the study area.

4.12 Transportation

4.12.1 No Action Alternative

4.12.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.11. Because the Project facilities would all be in place but non-operational, no staff would be required to support O&M activities. Therefore, there would be no impacts on transportation.

4.12.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no potential to affect the transportation resources described in Chapter 3 over the 30-year analysis period.

4.12.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on transportation are described in Section 5.3.11. Project O&M would also have limited potential to affect transportation related to minor increases in employee trips (up to 10 per day) to and within the Project Area. There could also be rare

occasions when a crane or other larger equipment may need to be transported to the Project site for major repairs or component replacement; however, in general, the level of increased traffic from O&M under Alternative 1 would be minor compared to the No Action Alternative and would occur mainly on private roads within the Project Area. In addition, the Project has been designed to and will obtain the appropriate approvals to ensure there would be no adverse impacts on nearby airport operations or military readiness.

Maintenance of the conservation lands would not be expected to increase vehicle trips compared to the No Action Alternative in the vicinity of Parcels A and B. Although vegetation thinning and subsequent monitoring would require travel to and within the area, this work would be infrequent and is not expected to represent an increase compared to the No Action Alternative.

The proposed power pole modifications would also result in a minor, short-term increase in vehicle trips (e.g., one to two per day per power pole) and would generally occur on roadways within the transmission line right-of-way, resulting in a minimal disruption to traffic compared to the No Action Alternative. Once the retrofit is completed, traffic would resume to existing levels. No impacts from derelict net removal are expected.

4.12.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.11. Once operational, the potential impacts on transportation in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.12.4 Alternative 3 – Enhanced Curtailment

The potential impacts on transportation from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.13 Noise

4.13.1 No Action Alternative

4.13.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.12. Because the Project would not be operational, there would be no Project-related noise increases.

4.13.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no noise impacts.

4.13.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on noise are described in Section 5.3.12. The Project would also result in ongoing operational noise from the WTGs, minor corona noise associated with the transmission line, and noise from Project activities at the O&M facility and Project vehicles. Anticipated noise levels from the WTGs at the nearest receptors are shown in Table 4.13-1 and would be below applicable environmental noise limits for residential receivers (HDR 2018).

Table 4.13-1. Modeled Noise Results for Residential Receivers

Receiver	EDNA Class	Limit Daytime/ Nighttime dBA	Nearest WTG	Distance to WTG (kilometers/miles)	Modeled Noise Level dBA	Potential for Impact
R01	A	60/50	T1	5.1/3.2	< 20	No
R02	A	60/50	T3	10.5/6.5	< 20	No
R03	A	60/50	T6	11.1/6.9	< 20	No
R04	A	60/50	T6	12.2/7.6	< 20	No
R05	A	60/50	T25	11.9/7.4	< 20	No

Note:
EDNA: Environmental Designations for Noise Abatement

Corona noise occurs when electricity from the transmission conductors comes in contact with air, causing a crackling, hissing, or humming sound. However, corona noise is generally a concern only with 345-kV lines or higher voltages. Because the Project transmission line is a lower-voltage 230-kV line and is in a remote area away from residences, as shown in Figure 1.1-1, corona noise is not anticipated to exceed the thresholds in Table 4.13-1.

Noise emissions from activities at the O&M facility would be intermittent and mostly occur during the day. An emergency generator will also be located there but would only operate during power

outages and occasional maintenance-related testing. Workers will also make daily trips to the O&M facility and within the Project Area for inspections and occasional repairs. These activities will only be related to a few trips per day and will mostly occur a long distance from residences.

Alternative 1 would also result in the acquisition and management of conservation lands to help offset authorized take of marbled murrelet. These lands are located in remote, mainly forested areas, with the nearest residences more than 0.8 kilometer (0.5 mile) away. Because the conservation lands would be managed for the benefit of marbled murrelets, noise disturbance over the course of the 30-year ITP in these areas would be limited and reduced from current noise levels generated by industrial forestry activities.

Depending on the extent of the modifications required by the eagle power pole retrofit program, there could be some noise increases associated with construction equipment and activity at and on the way to the selected poles; however, as noted in Section 2.3, work is expected to last 1 to 2 days per pole and would be completed during daytime hours to further limit the potential for noise disturbance. No impacts from derelict net removal are expected.

4.13.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.12. Once operational, the potential noise impacts from O&M activities under Alternative 2 would be lower than Alternative 1 because five of the turbines would be non-operational and would not produce noise. The potential for impacts from mitigation would be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.13.4 Alternative 3 – Enhanced Curtailment

The potential noise impacts from O&M activities under Alternative 3 would be lower than Alternatives 1 and 2 because turbines would be operational during fewer hours per year than in Alternatives 1 and 2, and non-operational turbines do not produce noise. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.14 Public Services and Utilities

4.14.1 No Action Alternative

4.14.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.13. There would be limited potential for ongoing impacts on public services and utilities. Because of the height of the WTGs, there would be a slight increase in the potential for lightning strikes that could result in increased fire risk; however, non-operational WTGs are less likely to be struck by lightning than rotating WTGs (Montanyà et al. 2014), and the existing fire protection services within the Project Area would be able to respond to a lightning-related fire incident. Section 4.15 further addresses health and safety impacts.

4.14.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no potential to affect the public services and utilities described in Chapter 3 over the 30-year analysis period.

4.14.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on public services and utilities are described in Section 5.3.13. Because Alternative 1 would enable the Project to operate, there is also the potential for increased demand on emergency response services compared to the No Action Alternative. Operation of the WTGs could slightly increase the potential risk of fire due to short-circuiting of electrical components or the increased risk of a lightning strike to the rotating turbine. There is also potential for fire along the transmission line because of the electrical nature of the system. Project O&M is not expected to exceed the capacity of existing fire services or law enforcement.

Overall, the Project would provide for increased energy production, although some localized increases in utilities demand would also occur for electricity, water, fiber optic, and telecommunications services at the O&M facility. However, these increases would be met by existing service providers and are not anticipated to exceed local supplies.

Implementation of the conservation strategies, including maintenance of the marbled murrelet lands and implementation of the eagle power pole retrofit program, would also have limited potential to result in impacts on public services or utilities providers. In general, these activities are not expected to require substantial demand for these resources and would be conducted in a manner to minimize the potential for service disruption. Implementation of the eagle power pole retrofit program may result in temporary disruption to service that would be coordinated with the utility provider. No impacts from derelict net removal are expected.

4.14.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.13. Once operational, the potential impacts on public services and utilities in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. The potential for impacts from mitigation would be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.14.4 Alternative 3 – Enhanced Curtailment

The potential impacts on public services and utilities from Alternative 3 would be the same as for Alternative 1 and slightly greater than the No Action Alternative. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.15 Health and Safety

4.15.1 No Action Alternative

4.15.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.14. Although the Project would not be operating, there would remain potential risks related to natural disasters such as wildfire and lightning strikes. To minimize these impacts, all equipment would include systems designed to protect against fire danger from lightning strikes, power surges, and equipment malfunctions.

The Project would also be required to comply with all applicable setbacks (minimum distance from property line within which building is prohibited) prior to construction. Adequate setbacks are an important factor in minimizing safety and nuisance concerns for the general public. In addition, signs and gates would be posted to prevent trespassing by the public recreating in the area. Site access would be restricted by gated and locked private access roads, and access to the WTGs would be well secured at all times.

4.15.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no impacts on health and safety related to the Project.

4.15.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The impacts of construction and decommissioning on health and safety are described in Section 5.3.14. Project O&M would introduce new health and safety risks, mainly for workers who may be required to work at great heights and with some materials that may be hazardous, such as solvents, fuels, or other chemicals. Additionally, consulting biologists and project staff may be exposed to safety risks, such as injuries from traversing uneven terrain or from ice-throw, while searching for carcasses as required under the HCP. Project O&M would be conducted in compliance with all applicable local, state, and federal safety, health ordinances, regulations, and standards, as well as any required plans and best management practices. A comprehensive Health and Safety Plan requiring adherence with all appropriate OSHA regulations would also be in place for all phases of the Project. The Health and Safety Plan would be implemented to manage and control safety risks, as well as guide responses in the case of emergency situations both in the Project Area as well as the Mitigation Areas.

While the potential for natural disasters to occur would be the same as the No Action Alternative, there is a slight potential for increased risk of lightning strike associated with operational WTGs (Montanyà et al. 2014).

Health and safety risks in the Mitigation Areas could occur related to the operation of heavy machinery and equipment for tree thinning and planting or power pole retrofitting; however, as noted above, a Health and Safety Plan would be implemented to minimize these risks, which would still remain slightly greater than the No Action Alternative. No impacts from derelict net removal are expected.

4.15.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.14. Once operational, the potential impacts on health and safety in the Project Area from O&M activities under Alternative 2 would be similar to but less than Alternative 1 and slightly greater than the No Action Alternative. Because not as many WTGs would be operated in comparison to Alternative 1, O&M activities would be even less because Alternative 2 would result in lower operations. The potential for impacts from mitigation would also be lower because there would be fewer power pole retrofits. While there would also be less take of marbled murrelet, it is unlikely that a smaller portion of the conservation lands would be purchased, and a decrease in funding a lower number of derelict net removals would not result in an appreciable difference in impacts.

4.15.4 Alternative 3 – Enhanced Curtailment

The potential impacts health and safety from O&M would be the same under Alternative 3 as for Alternative 1 because no substantial change in O&M activities is anticipated. Because of the lower level of take of marbled murrelet, the mitigation measures that would be implemented to offset potential take would likely be less but generally the same as what is described in Section 2.3.2.3 for Alternative 1. Fewer power poles would also be retrofitted and the associated impacts from implementing these mitigation measures would likely be lower.

4.16 Socioeconomics

4.16.1 No Action Alternative

4.16.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.15. Because the facilities would not generate energy, there would not be any expected increases in employment, income, population, or housing over the 30-year analysis period. However, it is expected that the Applicant would be required to pay some amount of property tax, the level of which cannot be quantified at this time.

The No Action Alternative is also expected to result in a decrease in timber excise tax collections because the location of the Project facilities would be taken out of commercial harvest. Timber production would continue over most of the Project Area but would not occur within about 770 acres consisting of the easements around the WTGs and within the transmission line right-of-way. In 2014, Lewis County had about 700,000 acres classified as Designated Forest Land (WSDR 2018e), so 770 acres represents about 0.1% of land being used for forest production and contributing revenues through the timber excise tax. Removal of these lands from production would result in a minimal impact in revenue streams from timber excise tax over the 30-year analysis period.

A common concern of wind projects is that they adversely impact the value of residential property. The mechanisms by which projects may affect property value include reducing the quality of views and introducing other adverse impacts to the aesthetic experience of property, including noise and light. The Project would not be located adjacent to any residential developments or land zoned for residential development, with the exception of the O&M facility located at the northern edge of the Project site in Thurston County, where land is zoned Rural Residential Resource. Based on the analysis in Section 4.9, there is low potential for adverse impacts on residential views, and adverse impacts on property values are expected to be minor, if they occur at all.

4.16.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no socioeconomic impacts related to the Project.

4.16.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The socioeconomic impacts of construction and decommissioning are described in Section 5.3.15. Project O&M would positively affect socioeconomic resources in terms of increased employment opportunities and income and increased opportunities for government revenue compared to the No Action Alternative. Impacts on population and housing are also discussed in the following sections.

4.16.2.1 Employment and Income

Operating the Project would require spending an average of approximately $7.4 million per year. This total includes equipment O&M, lease payments on the Project footprint, insurance, and other expenses.[9] Some of this spending may immediately leave the regional study area, but for the purposes of this analysis, the average annual total has the potential to generate positive economic impacts in the region. The economic impacts of operations costs were estimated using the IMPLAN model and categorized into direct, indirect, and induced effects.

Direct impacts are those caused by the purchase of goods and services in the local economy to directly support Project O&M. Indirect and induced effects are caused by direct spending and occur as a secondary benefit. Indirect effects occur when those who provide direct services to support Project O&M must also purchase goods or services to support that work. Induced impacts occur when those that benefit from increased direct spending in turn spend additional money in the economy at large.

Based on the IMPLAN model, the average direct value added in terms of income is approximately $2.3 million. The represents the increase in income that would occur as a direct result of the Project. The total output—direct, indirect, and induced—representing the economic effect of Project O&M would be about $11.4 million (ECONorthwest 2018). The results are summarized in Table 4.16-1.

[9] Decommissioning expenditures were included in the estimate, although related activities are not part of the requested ITP.

Table 4.16-1. Economic Impacts of Project-Related O&M Spending

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Output	$7,410,909	$2,635,241	$1,321,555	$11,367,705
Value Added	$2,340,677	$1,474,287	$798,202	$4,613,166
Labor Income	$741,315	$943,905	$442,449	$2,127,669
Job-Years	12[1]	14	8	34

Note:

1. This is the IMPLAN-calculated direct employment effect and differs from the estimate of 8 to 10 employees estimated by the Applicant for various reasons.

Based on IMPLAN modeling, Project O&M and the related level of spending noted herein are expected to result in 14 indirect jobs and 8 induced jobs. Combined with an estimated direct employment effect of up to 12 jobs, Project O&M would support about 34 total jobs in the regional study area.

Implementation of the required mitigation measures to purchase and maintain the conservation lands, fund derelict net removal, and retrofit power poles in the area targeted for the eagle power pole retrofit program would also result in increased spending, with some indirect and induced income and employment effects. Funding of these activities is discussed in greater detail in Chapter 8 of the HCP, and while beneficial, it is not expected to result in substantial changes affecting the local or regional economies. No impacts from derelict net removal are expected.

4.16.2.2 Population and Housing

Between 8 to 10 workers are expected to be needed to support Project O&M and could be hired locally or brought in from outside the region to fill the positions. If they come from outside the region, they will relocate their families to the local study area (assuming they have families). Even assuming each employee is hired from outside the region and brings three additional family members, the total increase in population in the study area will be very small relative to the current population of the local study area.

Assuming these workers come from outside the area, they will seek permanent housing within the local Project Area, likely within easy commuting distance to the O&M Facility in Thurston County, at the northern end of the Project Area. The community located closest to that area is Rainier, which currently has a relatively limited supply of housing and a rental vacancy rate near zero, based on the most recent data available from 2016. Although the increase in demand from new workers would not likely meaningfully impact the market for housing (i.e., increase demand sufficiently to impact prices), these workers may face challenges securing housing. Outside of Rainier, within the local study area, overall housing vacancy rates range

between 7% and 14%, and rental vacancy rates hover around 5%. These rates are consistent with the statewide averages and likely will not present a challenge for relocating employees.

Activities within the Mitigation Areas would also require periodic labor; however, because the extent of the work would be relatively minimal, involving a few individuals at a time periodically over the course of the 30-year ITP, it is expected the work would be staffed by resident workers, and the impacts on population and housing would be negligible.

4.16.2.3 Government Revenues

Project spending related to Project O&M would generate sales and use tax revenue at the state and local levels. Data on Project O&M costs are insufficiently detailed to estimate the value of these tax collections on an average annual basis; however, they would result in a small increase in collections for Washington State and Lewis and Thurston counties. The state would also tax gross income earned from the project during operation via the Public Utility tax. Insufficient information is available to determine the annual gross income for the entity that would operate the project to calculate the amount of annual tax collections, but this project would likely increase tax collections for the state of Washington.

Project operation would also generate property taxes. The Washington Department of Revenue (DOR) has not yet determined whether the project would be assessed locally or by the state. This determination has implications for the amount and distribution of property taxes in Lewis and Thurston Counties. If the project is assessed locally, assessed value would likely be based on the investment cost value of the project. Based on preliminary information from the applicant, the investment value of the property (including purchase of materials, design/engineering/planning, and installation) would be approximately $185 million in Lewis County and $2 million in Thurston County, and generate property tax revenue in its first year of operation of $2.1 million in Lewis and $25,500 in Thurston County. Revenue would be distributed among the state, county general funds, and special taxing districts (including fire and school districts). Depreciation would reduce the assessed value and property tax collections each year and may result in shifting tax burden to other tax payers as the project depreciates. If the DOR decides to assess the property—which is a more likely scenario because the project crosses county boundaries—the assessment would likely be based on the income-generating potential of the project. DOR would then allocate the resulting property tax revenue based on the project investment cost in each taxing district. Information is insufficient to estimate property taxes if DOR has authority, however collections likely would remain proportional to income generated from the project.

Similar to the No Action Alternative, the removal of lands at the Project Area from commercial timber harvest would result in a negligible decrease in timber excise tax. Similar changes would occur with respect to conversion of the conservation lands, in an amount up to 620 acres, from active timber harvest to conservation. In this case, 620 acres is likely a conservative estimate,

because 21 acres are restricted in harvest potential (and future contribution to timber excise tax collections) because of the presence of marbled murrelets and related harvest restrictions. In 2014, Pacific County had about 420,000 acres classified as Designated Forest Land (WSDR 2018e), so 620 acres represents about 0.1% of land being used for forest production and contributing revenues through the timber excise tax. As in Lewis County, removal of these lands from production would result in a minimal impact in revenue streams from timber excise tax over the 30-year ITP.

4.16.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.15. The socioeconomic impacts from operations under Alternative 2 would generally be beneficial (although slightly less so than under Alternative 1).

Alternative 2 would result in increases in income and employment opportunities compared to the No Action Alternative and would likely be similar to Alternative 1. There would also be a low potential for impacts on population and housing, similar to Alternative 1. While O&M-related spending would generate similar levels of sales and use tax revenues as Alternative 1, public utility tax revenues would decrease as they are assessed on gross income. Property tax revenues may accrue at a reduced level compared to Alternative 1 if the assessor determines the Project is less valuable without all WTGs operational. This decision would ultimately be based on the assessment method used to calculate assessed value. Energy production levels are expected to be up to 12% lower than Alternative 1.

4.16.4 Alternative 3 – Enhanced Curtailment

The employment, income, population, and housing impacts under Alternative 3 would be the same as Alternatives 1 and 2, as the Applicant expects O&M requirements not to vary meaningfully with reduced operations. Similar to Alternative 2, government revenues may accrue at a reduced level as the project generates less gross income and if the assessor determines the Project is less valuable if it generates less electricity. This decision would ultimately be based on the assessment method used to calculate assessed value. Energy production levels are expected to be up to 14% lower than Alternative 1.

4.17 Environmental Justice

4.17.1 No Action Alternative

4.17.1.1 Option A – No Project Operations

Under Option A, Project construction would have the potential to result in the impacts described in Section 5.3.16. The potential impacts related to the presence of non-operational, stationary

facilities would be related primarily to risks associated with damage to Project facilities that could expose the surrounding community to harm. As noted previously, the potential for these impacts would result in limited risks to the public because the facilities are located on private lands. Therefore, the No Action Alternative would not be expected to result in disproportionate impacts on minority or low-income populations.

4.17.1.2 Option B – No Project Construction

If the Applicant decided not to construct the Project, there would be no impacts that would disproportionately affect minority or low-income populations related to the Project.

4.17.2 Alternative 1 – Habitat Conservation Plan

Under Alternative 1, if the Applicant has not already constructed the Project, the Service's determination to issue the ITP would likely lead to Project construction. The potential impacts of construction and decommissioning on minority and low-income populations are described in Section 5.3.16. The potential impacts associated with ongoing Project O&M are not expected to disproportionately affect minority or low-income populations within the vicinity of the Project Area. Aside from light traffic to and within the Project Area via access roads to inspect the WTGs and associated support facilities, all work would take place on private property located away from public infrastructure and private residences. Similarly, the potential for impacts within the conservation lands is generally expected to be limited to the private lands or to occur equally within the area targeted for the eagle power pole retrofit program and therefore would not result in any disproportionate impacts affecting minority or low-income populations. No impacts from derelict net removal are expected.

4.17.3 Alternative 2 – Modified Project Site Design

Similar to Alternative 1, the Service's determination to issue the ITP may result in Project construction, if it has not already occurred. The potential impacts of construction and decommissioning are described in Section 5.3.16. As noted previously, the potential environmental impacts are equivalent for Alternative 2 compared to Alternative 1. Therefore, for the same reasons noted in Section 4.17.2, Alternative 2 would also not be expected to result in disproportionate impacts on minority or low-income populations.

4.17.4 Alternative 3 – Enhanced Curtailment

As noted previously, the potential environmental impacts are generally the same but lower for Alternative 3 compared to Alternatives 1 and 2. Therefore, for the same reasons noted under Section 4.17.2, Alternative 3 would also not be expected to result in disproportionate impacts on minority or low-income populations.

4.18 Irreversible and Irretrievable Commitment of Resources

Irreversible commitment of resources refers to the loss of future options for resource development or management, especially of nonrenewable resources such as minerals, cultural resources, or fossil fuels, as a result of the Proposed Action (40 CFR 1508.1 1). Irretrievable commitment of resources also refers to the lost production or use value of renewable natural resources as a result of the Proposed Action (40 CFR 1508.1 1).

While the use of some amount of resources, such as fossil fuels and other materials (e.g., turbine replacement parts) would be required for Project O&M activities, the irreversible and irretrievable commitment of these resources would be the same under all the Action Alternatives. None of the alternatives would result in in the irreversible loss of cultural resources or natural resources, such as water resources, soils, or agricultural or timber land.

Implementation of the conservation strategies under Alternatives 1, 2, and 3 would also require the minor use of resources, such as fossil fuels for vehicles and equipment operation, compared to the No Action Alternative; overall, however, implementation of those strategies would result in a net benefit to the Covered Species by preserving and enhancing marbled murrelet habitat at the conservation lands, minimizing the potential for marbled murrelet entanglement in derelict fishing nets, and minimizing the potential for impacts on golden eagles associated with power pole electrocution.

Issuance of the ITP under Alternatives 1, 2, and 3, would also allow the Project to be operational, meaning there would be more power delivered to the grid that would offset the generation of energy at existing conventional power plants that use fossil fuels. Alternative 1 would result in the highest energy production levels, followed by Alternatives 2 and 3.

4.19 Unavoidable Adverse Effects

As described in Sections 4.2 through 4.17, the potential impacts associated with the Proposed Action are anticipated to be minor and generally the same as the No Action Alternative for the majority of resource areas, with the exception of the potential impacts on vegetation (Section 4.5); wildlife (Section 4.6); threatened, endangered, and rare species (Section 4.7); and socioeconomics (Section 4.16). The greatest potential for significant impacts would occur as the result of impacts on wildlife and the take of the Covered Species. As described in Chapter 2, Alternatives 1, 2, and 3 all require the implementation of conservation strategies that would ensure any adverse effects from the potential take of the Covered Species is offset consistent with ESA Section 10(a)(2)(B) issuance criteria. Therefore, the potential unavoidable adverse effects would be limited.

4.20 Short-Term Use Versus Long-Term Productivity

As discussed in Section 4.19, there would be relatively minor increases in the commitment of resources required under Alternatives 1, 2, and 3 when compared to the No Action Alternative. These differences compared to the No Action Alternative would result from minor and intermittent activities related to O&M of the Project facilities and implementation of the conservation strategies. In the shorter term, the use of these resources (e.g., fossil fuels) would allow for the Project to operate at higher levels, producing increased levels of renewable energy and resulting in an increase in productivity overall in the longer term.

Under the No Action Alternative, the Project would be non-operational, and no change would occur in the short-term uses of the environment. Similarly, effects to long-term productivity of the environment under the No Action Alternative are not anticipated. Under Alternatives 1, 2, and 3, O&M activities would result in the same short-term uses of the environment as well as additional uses associated with implementation of conservation strategies on conservation lands. Long-term uses of the environment would include conservation lands that would result in restored habitat and enhanced long-term species productivity.

5 Connected Actions

Connected actions are actions that are closely related to the Proposed Action and should be addressed in the same EIS (40 CFR 1508.25). As discussed in Chapter 1, the Applicant is not seeking take coverage for construction or decommissioning and accepts the liability of conducting these activities should they result in a violation of the ESA or the BGEPA; however, because these activities are connected actions, they are addressed in this EIS.

Project siting, construction, and decommissioning would require (among other permits and approvals) a substantial shoreline development permit from Lewis County and a special use permit from Thurston County. These are the agencies responsible for implementing local land use regulations and ensuring the Project facilities are an allowed use of the land. Although these agencies do not have authority over all required permits, they are responsible for ensuring that the proposed location, construction, operation, and decommissioning of the Project demonstrate compliance with applicable local, state, and federal law consistent with county regulation and the Washington State Environmental Policy Act. In addition, the Office of Surface Mining Reclamation and Enforcement has permitting oversight for portions of the transmission lines on the TransAlta Corporation mine property and is preparing a NEPA environmental assessment for this land use change.[10]

[10] This environmental assessment document can be accessed at https://www.wrcc.osmre.gov/initiatives/centraliaMine.shtm.

Other local, state, and federal agencies, as noted in the discussion that follows, are responsible for enforcing compliance with applicable regulations to ensure the Applicant meets required conditions prior to constructing and operating the Project. These requirements are summarized in the following sections where applicable in reference to the construction and decommissioning impacts they are intended to address.

5.1 Project Construction

The Applicant intends to construct the facilities described in Section 5.1.1 in avoidance of take of the Covered Species. Construction would occur in a phased manner over a 9- to 12-month period, beginning by mid-2019. The average size of the construction workforce will be about 110 workers, with a peak of approximately 250 workers.

Construction will begin with the improvement of existing roads and the installation of new gravel access roads that allow access to work sites. Staging and equipment lay-down areas will cover about 15 acres and are currently planned near the O&M Facility (approximately 13 acres) and the WTGs (approximately 2 acres).

WTG locations will be cleared, graded, and foundations excavated. Blasting may be required at WTG locations where bedrock is present near the ground surface. An engineered concrete foundation will be installed in the excavated structure location with grading done to allow for drainage away from each tower. Construction activities at the WTG sites and other facilities, such as the O&M facility and new substation, include vegetation clearing, topsoil stripping, excavation, grading, foundation construction, and final grading.

Underground cable installation construction activities include topsoil stripping, trenching, installing medium voltage cable, and revegetation of disturbed areas unless the cables are under the roads. It is anticipated that no significant grading would be required, except for minor grading of immediate terrain as necessary for safe access and operation. The construction sequence for the transmission line interconnection includes constructing new access roads, clearing vegetation to establish a 200-foot construction right-of-way for the transmission line corridor, constructing the line and stringing conductors/static wires.

This work would be accomplished using aerial lift devices (such as cranes or booms), bull dozers, various trucks (for dumping, pulling, or concrete mixing), rock crushers, compactors, drill rigs and trenching machinery, among other typical work equipment.

5.1.1 Project Facilities

5.1.1.1 Wind Turbines and Towers

The locations of the proposed WTGs are shown in Figure 5.1-1. The WTGs are identified as T1 through T38 from west to east. Depending on the specific model chosen during final siting and

permitting activities, the WTGs are expected to range from 80 to 150 meters (262 to 492 feet) tall and 108 to 136 meters (354 to 226 feet) wide. A typical WTG consists of three blades. The WTGs will begin to generate electricity at wind speeds of approximately 9.7 kilometers (6 miles) per hour and will be shut down at speeds exceeding 90.1 kilometers (56 miles) per hour. Each WTG would sit atop a steel-and-concrete foundation designed for the specific subsurface conditions at its individual WTG site. Aboveground, the foundation would cover up to 6.1 meters (20 feet) in diameter and include a permanent crane pad and cleared area for WTG access and maintenance.

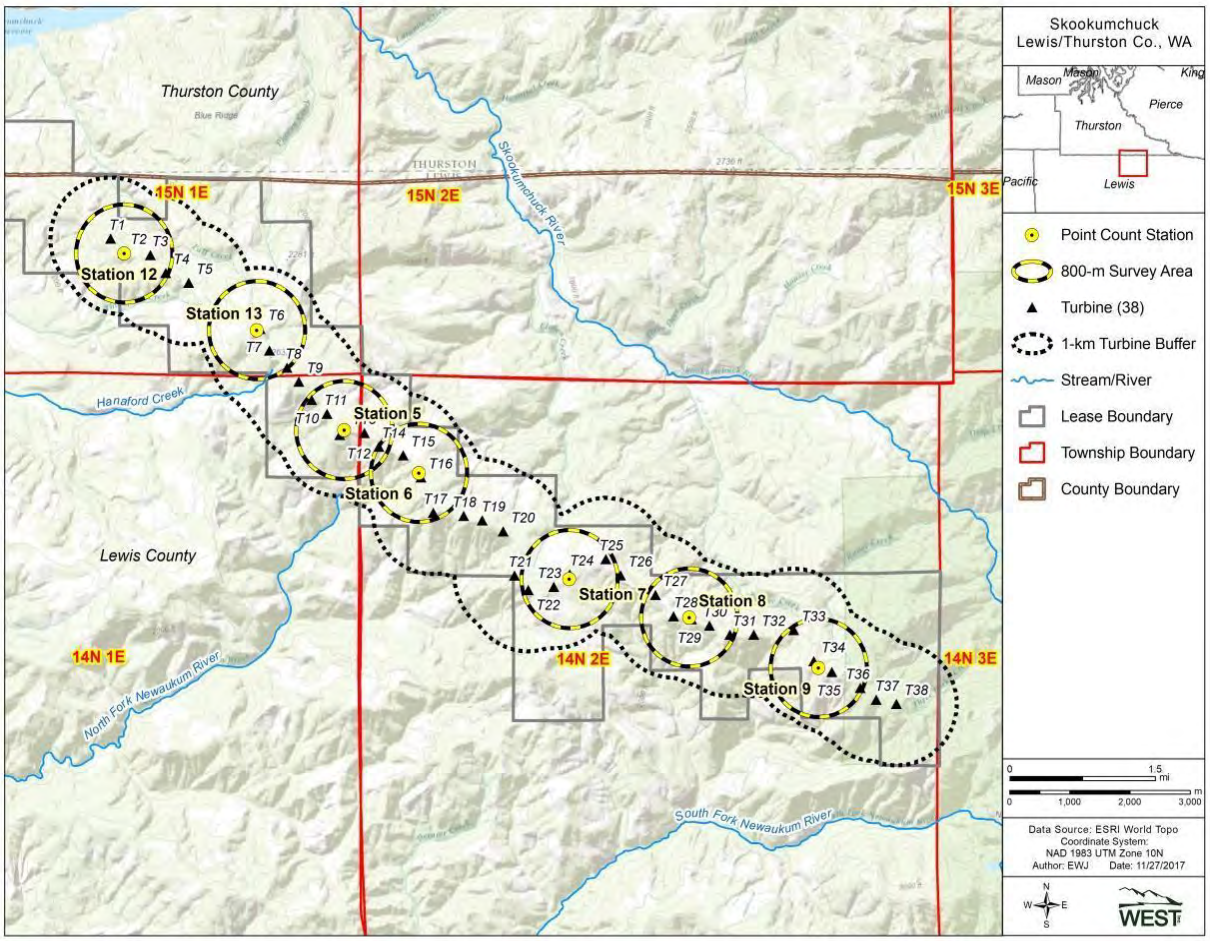

Figure 5.1-1. Project Wind Turbine Generator Locations (Project HCP; Chambers Group and WEST 2019)

5.1.1.2 Collection System

A medium-voltage electrical system of underground cables ("collector lines") will transmit energy generated by each WTG to the Project substation. The proposed collector line corridors, shown in Figure 5.1-1, will be maintained for continued access by keeping vegetation cleared.

The right-of-way will be 9.1 meters (30 feet) wide where combined with roadways but otherwise 4.6 meters (15 feet) where not combined with roadways.

5.1.1.3 Project Substation

An electrical substation near T15 will provide an increase in voltage from the 34.5-kV power collection system to the 115-kV voltage transmitted to the Tono substation. The Project substation will occupy approximately 5 acres and be covered with gravel and surrounded by a chain-link fence. It will also include a maintenance yard and vehicle shelter to store spare parts, road maintenance vehicles, and fire-fighting equipment.

5.1.1.4 Project Transmission Line

A transmission line approximately 24.1 kilometers (17 miles) in length and consisting of monopole or H-frame structures will transmit the energy generated by the Project to the Tono substation. The route will be determined during final siting and permitting process but will be located within the corridor shown in Figure 5.1-1. The height of the transmission structures will not exceed 35.1 meters (115 feet) and will be located within public right-of-way or private lands. The structures placed on privately owned lands will not support other infrastructure (i.e., Lewis County Public Utility District distribution lines).

5.1.1.5 Access Roads

Access will be provided via approximately 36.5 miles of improved existing access roads and approximately 3.9 miles of new access roads. Existing access routes are shown in Figure 2.1-1.

5.1.1.6 Operations and Maintenance Facility

The proposed O&M facility location is adjacent to Weyerhaeuser's existing operations center in Thurston County (Figure 5.1-1). The O&M facility would house the control center for the WTGs (including the supervisory control and data acquisition [SCADA] system and telecommunication facilities that would monitor and control the WTGs), employee parking, and equipment storage. The SCADA system uses fiber-optic communication lines running parallel to the underground collection system.

5.1.1.7 Meteorological Towers

The location of up to three meteorological towers will be selected during the final siting process. It is expected that the proposed towers will range from 67.4 to 79.9 meters (221 to 262 feet) in height and require a base of approximately 8.2 by 8.2 meters (27 by 27 feet). The Project will use self-supporting permanent meteorological towers, thereby minimizing avian collisions by avoiding the use of guy-lines to support the towers.

5.1.1.8 Safety and Security Systems

Aircraft safety lighting will be installed on the exterior of approximately 26 of the WTGs to comply with FAA rules and will consist of synchronized, low-intensity, flashing red lights for nighttime use in accordance with FAA requirements. Each WTG, including rotor blades, will also be equipped with lightning protection systems to safely transfer lightning to the ground and built-in fire protection features, including a fire suppression system and a system to monitor nacelle temperatures to shut down the WTG and send an alarm if temperature limits are exceeded.

5.2 Project Decommissioning

The service life of the Project is expected to be 30 years. At the end of the Project lifetime, the Project will be decommissioned in accordance with Landowner lease requirements. A specific plan for decommissioning will be prepared at that time. The Landowner may choose to retain roads, foundations, buildings, and structures. The Applicant will comply with all regulatory requirements, including obtaining demolition permits and complying with permit conditions for removal of WTGs and structures from the site.

Decommissioning activities will be completed within approximately one year and will involve the use of mechanized equipment similar to that used for construction. Materials resulting from decommissioning will be salvaged for re-sale or scrap value, recycled, or disposed of at appropriate waste facilities in accordance with all applicable laws and regulations.

Decommissioning of the WTGs will involve disassembly and removal of aboveground WTG components. WTG foundations will be left in place provided that all bolts or steel extending above concrete will be removed and the surface of the ground covered with soil. Slopes will be regraded and restored as reasonably possible to their original or other usable grade. Collector lines connecting to the transformers will be left in place if permitted by permits and legal requirements.

The Project substation and O&M Facility will be demolished and the foundation of these buildings removed to a depth of 3 feet. Security fencing and gravel will be removed from the ground surfaces of the Project substation and O&M Facility yards. Areas beneath the removed O&M Facility will be scarified so that forestry operations can resume. The 115-kV gen-tie lines and supporting structures will be disconnected and removed. Meteorological towers and IdentiFlight will also be disassembled and removed from the site. Project access roads will be left in place for ongoing use associated with forestry operations.

5.3 Environmental Consequences

5.3.1 Geology and Soils

Construction of the Project has the potential to affect geology and soils through soil compaction from use of heavy equipment and in areas exposed to repeated off-road traffic, increased erosion in areas where grading and vegetation removal occur, and permanent changes in topography from the construction of WTGs and access roads. It is estimated that the Project would alter 330 acres in total, with an additional temporary ground disturbance of about 431 acres. About 290,522 cubic yards of cut and 180,888 cubic yards of fill would be required for the Project overall. Placement of some Project features within steeper areas may also result in increased risks related to landslides.

To minimize the impacts of soil compaction, the Applicant would only operate heavy equipment and vehicles on access roads and within construction footprints approved by Lewis and Thurston counties during the siting permitting process. Any off-road construction will be limited to the extent practicable.

Erosion-related impacts associated with Project disturbance would occur mostly during and immediately after construction until revegetation, drainage, and erosion controls are established; however, erosion and sediment control measures will be put in place to stabilize slopes and control construction stormwater runoff as would be required by Lewis and Thurston counties and the requirement to obtain and comply with a National Pollution Discharge Elimination System (NPDES) Construction Permit from the Washington State Department of Ecology. The NPDES permit process would require the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP), which would also include plans to control sediment (e.g., Temporary Erosion and Sediment Control Plan) and minimize spill risk (e.g., Spill Prevention Control and Countermeasures Plan).

Some changes in topography would also occur at locations where Project facilities would be constructed, though mapped landslide deposits have been identified along portions of access roads and adjacent to WTGs T21 through T26, the proposed Project substation, and one of the proposed laydown areas/batch plant options (RGI 2017). Although the Project would not change the likelihood of an earthquake, the presence of the facilities would increase the risk of damage to those structures or workers in the vicinity. The Project will be designed and constructed consistent with appropriate building standards as required by Lewis and Thurston counties to minimize risks associated with geologic hazards, such as landslides and seismic events.

Decommissioning activities will be similar in type but shorter in duration compared to those anticipated for the construction phase. In accordance with landowner lease requirements, WTG foundations will be left in place provided that all bolts or steel extending above concrete will be

removed and the surface of the ground covered with soil. Slopes will be regraded to restore them as reasonably possible to their original or other usable grade.

5.3.2 Air Quality

Air emissions generated by Project construction activities would come from exhaust emissions from operation of construction equipment and construction vehicles; fugitive dust particles from ground disturbance associated with the use of Project site and access roads (including tree/vegetation clearing activities and dust from mobile equipment and vehicles); and emissions generated by quarrying and operation of a portable, temporary concrete batch plant and rock crusher (if employed). Odors associated with exhaust from diesel equipment and vehicles could also be a nuisance during construction.

The Olympic Region Clean Air Agency and the Southwest Clean Air Agency enforce regulations related to construction emissions, including fugitive dust. The Applicant will be required to comply with these regulations and obtain any necessary permits for non-stationary sources of emission, such as the concrete batch plant and rock crusher. Operation of diesel equipment and vehicles during construction would temporarily produce some odors, which would only be most noticeable in the immediate vicinity of construction sites and would not affect the general public because the nearest residence would be located approximately 5.1 kilometers (3.2 miles) from the nearest WTG.

Decommissioning activities will generate emissions similar to those generated during construction, primarily from construction vehicle exhaust emissions and fugitive dust particles. The amount of pollutants generated from vehicle exhaust emissions and fugitive dust will be relatively small and similar to emissions from other equipment commonly used for construction and timber operations in Lewis and Thurston counties. Decommissioning will take place concurrently among multiple locations in and near the study area at any given time and will be dispersed rather than concentrated in a specific location.

5.3.3 Water Resources

5.3.3.1 Surface Waters

The Project facilities would not be located within any rivers, stream, or creeks, would not require any in-water construction or use of these waters, and would be sited to avoid stream buffers to the maximum extent possible; however, some facilities would be constructed near or over waterways, resulting in increased potential for indirect impacts on water quality in the event of an accidental spill or from increased erosion and resulting turbidity. Potential impacts on wetlands are addressed in Section 5.3.4.

More specifically, a new access road is proposed along the bank of the Skookumchuck River that is outside the floodplain but within shorelines of the state. Construction would require cut and fill

within the shoreline buffer. The proposed transmission line alignment would also cross Hanaford and Packwood creeks, as well as 19 unnamed tributaries to Hanaford Creek, and come near Coal Creek. Construction in the vicinity of these streams would be limited to vehicles working in the shoreline area to string the transmission line cables. No other activities, such as excavation or grading, would occur within the ordinary high water mark of these streams, and any new transmission structures would be placed outside of the regulated stream buffers as well as outside of shoreline jurisdiction for shorelines of the state (Hanaford Creek). Construction would also require vehicles and equipment to routinely cross Eleven, Fall, Laramie, Pheeny, Range, and Run creeks and to come near Twelve Creek. Road crossings would also occur at seven unnamed creeks. Construction impacts could degrade water quality if erosion and subsequent stream sedimentation are not appropriately controlled. The Applicant has submitted all appropriate permit applications to Thurston and Lewis counties and will be required to implement measures to ensure compliance with the county's Shoreline Master Program and other applicable regulations intended to protect water resources. In addition, as noted previously, the Applicant will be required to obtain and implement an NPDES permit for construction, which will also require measures to protect water resources consistent with local, state, and federal law.

The greatest potential for affecting water resources during construction would occur as the result of constructing the electrical collector system, which would cross Eleven Creek and an unnamed stream (1225988467332) and would come within 30.5 to 61.0 meters (100 to 200 feet) of the North Fork Newaukum River and Twelve Creek. Construction would occur within existing access road rights-of-way to the extent possible to minimize impacts; however, trenching stream crossings may be necessary and could require dewatering or redirecting the stream, depending on streamflow conditions. Work within these streams would require a permit from the U.S. Army Corps of Engineers and the Washington State Department of Ecology under the Clean Water Act. In the event such work occurs, it would be required to be completed in a manner to avoid, minimize, and mitigate for any impacts. If a total maximum daily load is required, both the Washington State Department of Ecology and the U.S. Environmental Protection Agency would have oversight.

Undesirable temperature is the primary indication of existing impaired water bodies in the Project Area, resulting primarily from exposure of stream surfaces to sunlight following tree harvesting. Further degradation from Project construction activities is not expected because no vegetation would be removed within stream buffers, except for minimal removal in the shoreline area of the Skookumchuck River.

5.3.3.2 Groundwater

Groundwater may be encountered during Project excavation activities conducted in low-lying areas. If groundwater is encountered during excavation and construction activities and dewatering is required, the Applicant would ensure that water generated from dewatering would

be discharged to upland areas using dissipaters or other means to allow distribution of the water over a large surface area to facilitate evaporation and/or infiltration consistent with the terms of the NPDES construction permit. Dissipaters, sediment basins, and/or fabric bags would be used, if necessary, to avoid transport of silt into adjacent areas. No direct discharge to surface waters or riparian areas would occur during dewatering; upland discharge would be done away from surface water bodies. No wellhead protection areas or source water protection areas would be affected during construction of the Project.

5.3.3.3 Floodplains

Only a few small portions of the Project Area, including access to the site on Vail Cut Off Road and small portions along the transmission line, are located within a 100-year floodplain. No construction of Project facilities is proposed within regulated floodplains. An existing roadway would be used during Project construction that is located in a floodplain; however, use would not result in placement of fill in the flood plain or otherwise affect flood storage.

Decommissioning activities will be similar in type but shorter in duration compared to those anticipated during construction. Water will be used primarily for dust suppression. Surface water runoff and erosion will be the impact of greatest concern during decommissioning when soil is disturbed.

5.3.4 Vegetation and Wetlands

Certain project construction activities would affect vegetation and wetlands through short-term or temporary disturbance as well as vegetation removal that would have more long-term or permanent effects. Temporary disturbance would occur as the result of activities such as staging, stockpiling, and from vegetation removal that would eventually regrow or that was otherwise to be cleared from future timber harvest (e.g., some areas of Evergreen Forest). Permanent impacts would occur as the result clearing vegetation would be converted to Project facilities.

Construction would temporarily disturb about 431 acres of land and would result in the permanent conversion of 330 acres to Project facilities. Land cover type impacts are shown in Table 5.3-1 and mainly affect evergreen forest, shrub/scrub, and developed areas, which include existing roadways. Based on the National Land Cover Database, there would also be a potential for wetland impacts.

Table 5.3-1. Estimated Temporary and Permanent Impacts by Cover Type

Land Cover Classification	Temporary Impacts (Acres)	Permanent Impacts (Acres)
Evergreen Forest	154	103
Shrub/Scrub	132	112
Developed	69	52
Barren Land (Rock/Sand/Clay)	43	35
Grassland/Herbaceous	12	9
Mixed Forest	7	7
Wetlands[1]	11	10
Deciduous Forest	3	3
Open Water[1]	< 1	< 1
Total	**431**	**330**

Notes:
Source: National Land Cover Database

1. Wetlands and open water habitats shown are based on mapping by the National Land Cover Database and have not been field-verified.

Temporary impacts would occur where vegetation would be cleared and may be disturbed in temporary work areas. For example, heavy equipment would be driven through some areas, including existing roadways over streams and drainages, and stored in others. These activities can temporarily disturb vegetation and wetlands by crushing, removing, or covering vegetation in dust; by compacting soils; introducing noxious weeds; and increasing the chance of spills or other pollutants reaching sensitive areas. The Applicant will be required to avoid sensitive areas to the extent practicable by Lewis and Thurston counties. Where upland areas are temporarily disturbed, the Applicant will restore or revegetate the affected areas after construction consistent with county requirements.

The Applicant will also be required by Lewis and Thurston Counties to complete field verifications of vegetation, including wetlands and other waters prior to construction. If work within a sensitive area, such as a wetland or other water of the U.S. or state or its buffer is deemed unavoidable, the Applicant will be required to comply with additional applicable local, state, and federal regulations, including but not limited to the Clean Water Act, with additional oversight provided by the Washington State Department of Ecology, the U.S. Army Corps of Engineers, and other resource agencies as appropriate. Enforcement by these agencies would require measures to avoid, minimize, and mitigate the impacts prior to construction. This would include compensation for any permanent impacts, should they occur.

Construction of the Project would result in the permanent conversion or loss of mainly evergreen forest, shrub/scrub, and developed areas, for the facilities described in Section 5.1.1. The

determination of whether to allow conversion of these areas to Project uses is under the jurisdiction of Lewis and Thurston counties and would be required to be implemented consistent with local land use standards and other applicable laws. Impacts affecting sensitive areas, including wetlands, would require further review and oversight by other resource agencies, prior to construction.

Decommissioning activities will result in the similar impacts to vegetation and wetland resources as Project construction activities.

5.3.5 Fish and Wildlife

Project construction has the potential to adversely affect fish and wildlife by increasing the risk of harm and by reducing the amount or quality of habitat. As discussed in Section 3.6, the Project Area supports various species of fish, birds, bat, mammals, and amphibians that if present during construction could be adversely affected.

Potential impacts on fish and other aquatic species would occur as the result of degradation or loss of aquatic habitat. Potential impacts affecting specific surface waters are described Section 5.3.3 and mainly include increased risks from contaminated stormwater runoff. No permanent loss is expected as the result of the Project because there will be no permanent loss of habitat; however, as noted in Section 5.3.4, temporary water quality impacts could occur. If such impacts would occur, they will be addressed through the site design permitting process lead by Lewis and Thurston counties. As discussed above, the Applicant intends to avoid and minimize impacts on surface waters to the extent practical consistent with applicable permitting requirements, which would ensure any risks to fish and aquatic species would be adequately addressed.

Terrestrial species also have the potential to be adversely affected during construction. For example, mortality of some species (such as birds and tree bats) may occur when vegetation that contains occupied nests is cleared. There is also the potential for collision mortality of birds, mammals, reptiles, and amphibians as construction crews drive on site between locations. The noise and activity associated with construction crews and equipment may displace some species from the immediate area. Because construction would last up to 1 year, the breeding of some species could be disturbed by construction activities. Considerations specific to special-status species are addressed in Section 5.3.6.

As shown in Table 5.3-1, the Project would convert about 330 acres from the underlying land cover type to Project facilities. With respect to wildlife habitat, this mainly includes the loss of evergreen, mixed, and deciduous forest; shrub/scrub; and grasslands. As noted in Section 5.3.4, the Applicant intends to avoid permanent impacts on wetlands. The determination to allow conversion of upland areas to Project uses is under the jurisdiction of Lewis and Thurston counties and would be required to be implemented consistent with local land use standards and

other applicable laws. Impacts affecting sensitive areas, particularly those that provide habitat to special-status wildlife species, may require further review and oversight by other resource agencies, prior to construction.

Decommissioning activities will result in the similar impacts to fish and wildlife resources as Project construction activities.

5.3.6 Rare, Threatened, and Endangered Species

5.3.6.1 Marbled Murrelet

As noted in Section 3.6, survey results of the Project Area (ABR 2015) have shown that marbled murrelets do not appear to reside within the area that would be affected by Project construction. As a result, although possible, potential impacts associated with on-site risks, such as exposure to increased noise and activity, or harm from collisions with vehicles or equipment, are not likely to affect this species. However, as the Project facilities are erected, there is a chance for collisions with non-operational WTGs and meteorological towers. Risk of collision with other facilities such as the transmission line are also possible but less likely. The risks of collision-related mortality with non-operational WTGs and other stationary features, such the transmission line and meteorological towers, are addressed in Section 4.7. Risks during the construction period would be somewhat lower because the WTGs would be constructed in phases. Any liability associated with the potential for impacts on marbled murrelet during the construction period, including the transmission line, would be the responsibility of the Applicant.

5.3.6.2 Bald and Golden Eagle

Bald eagles were observed within the Project Area during surveys; although there are no documented records of breeding within 2 miles of the Project Area. Impacts due to construction disturbance are considered low given the low number of bald eagles seen using the Project Area and no known nests.

Potential impacts to the golden eagle during construction of the Project pertain to disturbance that will cause continued avoidance. Breeding nearby is unlikely given the fact that no golden eagles were observed during the avian point count surveys that spanned five seasons, and if a resident pair was present, they would likely have been observed at least once during these surveys.

As the Project facilities are erected, there is a small chance for collisions with non-operational WTGs and meteorological towers. Risk of collision with other facilities such as the transmission line are also possible but less likely. The risks of collision-related mortality with non-operational WTGs and other stationary features, such the transmission line and meteorological towers, are low and are borne by the Applicant and addressed in Section 4.7. Any liability associated with the potential for impacts during the construction period would be the responsibility of the Applicant.

5.3.6.3 Other Special-Status Species

Other special status species that have been observed, or have a likelihood to occur, in the Project Area include northern goshawk, pileated woodpecker, Vaux's swift, and Townsend's big-eared bat. Although no individuals of northern goshawk were observed within the Project Area, the potential exists for them to use the Project Area while foraging or migrating. However, any use of the Project Area for these purposes would be short term. As a result, although possible, potential impacts associated with vehicle collision or other impacts from construction activity in general (e.g., increased noise), are not likely to affect this species.

The pileated woodpecker, Vaux's swift, and Townsend's big-eared bat were observed during avian use surveys. Consequently, these species may be affected by the loss of habitat from the clearing of forest habitats (approximately 164 acres of temporary and 113 acres of permanent impact to National Land Cover Database-mapped evergreen, mixed, and deciduous forests combined) or are at risk of mortality due to the potential destruction of a nest with eggs or nestlings. It is also possible that they may be indirectly disturbed by construction activities during the breeding season or foraging activities due to noise in adjacent mature forested habitats.

Decommissioning activities will result in the similar impacts to these species as Project construction activities. However, there would not be impacts associated with loss of habitat and it would be expected that the habitat would be replanted with trees so that it would eventually provide mature forested habitat for these species.

5.3.7 Land Use and Recreation

Project construction would have the potential to disrupt surrounding land uses within the Project Area, mainly residential, timber harvest, and recreational uses, and conflict with zoning or other applicable plans or programs, such as Lewis and Thurston counties' Shoreline Master Programs.

As noted in Section 3.8, the Project Area is mainly located on privately owned lands that are currently in active timber harvest. Impacts to commercial forestry within and around the Project Area would occur mainly due to traffic delays or temporary road closures caused by increased Project-related construction traffic. In addition, it is expected that timber harvesting would stop in some parts of the Project Area to reduce land use conflicts. Construction would result in increases in air and noise emissions, that may disrupt surrounding land uses, including residents and recreationalists. As noted previously, the nearest residences and publicly accessible recreational area (the Gifford Pinchot National Forest) are also located approximately 0.7 kilometer (0.4 mile) from the closest WTG, which is far enough away that people are unlikely to hear or see construction activity.

Project construction would also result in disturbance to shorelines of the state as regulated by Lewis and Thurston counties through implementation of their Shoreline Master Program.

Certain Project features are proposed within these areas, including the transmission line poles and a section of access road near the Skookumchuck River. The Applicant has applied for local permits (Smith 2017) and will be required to comply with the Shoreline Master Program where applicable to ensure the potential impacts are addressed and that Project construction is consistent with all applicable land use plans. As part of the local land use review, Lewis and Thurston counties would ensure compliance with the appropriate local land use plans and policies.

Decommissioning of Project facilities will not permanently alter land use in either Lewis or Thurston counties. Following decommissioning, land on which the O&M Facility is constructed will be available for other development consistent with its comprehensive planning designation, commercial forestry lands on which Project facilities were constructed will be placed back into service, and Project access roads will remain in support of forest management and harvest.

5.3.8 Visual Resources

In the short term, construction would result in visual changes from increased activity involving the use of heavy equipment and increased traffic on area roadways, grading, and selective vegetation clearing. Some nighttime lighting may also be required for construction. The effects of construction lighting would be temporary, lasting only during the specific activity period (estimated at 6 months for WTG erection). Hours of construction would be limited from 7:00 a.m. to 6:00 p.m.

Direct views of the proposed Project facilities from surrounding areas within the "typical viewshed" 24.1-kilometer (15-mile) radius of the Project Area would be largely limited from the east by vegetation and topography. Some residential areas, mainly to the north near Rainer and south around Mossy Rock, would have visibility of the WTGs; however, intervening vegetation would block views for most residences in the surrounding vicinity. The Project facilities would also be visible to motorists on area roadways, mainly to the north near Yelm Avenue on State Route 507 and to the south along U.S. Highway 12 near Mossy Rock. Visual impacts associated with siting are under the jurisdiction of Lewis and Thurston counties. The impacts associated with operation of the facilities are addressed in Section 4.9.

Following decommissioning, Project structures will no longer be visible as all above-ground structures will be removed. For several years after decommissioning, site disturbance will be visible until vegetation has established, or the sites are converted to their future use.

5.3.9 Cultural and Historic Resources

As noted in Section 3.10, no cultural or historic resources eligible for listing on the NRHP, including sites or structures, have been documented within the Project Area (Chambers Group 2018). However, ground-disturbing activities would have the potential to affect previously unidentified archaeological or tribal resources. Because the authorization of Project siting and construction are

under the jurisdiction of the local land use permitting authorities (Lewis and Thurston counties), these entities are responsible for ensuring cultural and historic resources are addressed consistent with Washington Administrative Code 365-196-450. To this end, the Applicant intends to have a qualified cultural resources monitor be present for vegetation clearing and ground-disturbing activities and will be required to develop and implement an Inadvertent Discoveries Plan that will include stopping work and following the appropriate protocol to avoid, minimize, and mitigate any impacts. Lewis and Thurston counties will be responsible for ensuring this plan is enforced. The potential for construction-related impacts on tribal resources is addressed in Section 5.3.10.

Decommissioning of the Project is not anticipated to have an impact on cultural resources unless activities go beyond areas previously disturbed during construction of the Project. If any of the decommissioning activities cause ground disturbance in areas not previously surveyed for cultural resources, there could be impacts to undocumented cultural resources.

5.3.10 Tribal Resources

Specific to the potential for impacts from Project siting, construction, and decommissioning, the Applicant initiated outreach to the Confederated Tribes of the Chehalis Reservation and the Nisqually Indian Tribe in 2016 and 2017. Emphasis was made to determine whether any Traditional Cultural Properties or other properties of cultural significance were present within the Project Area. Outreach consisted of emails and phone conversations and resulted in the Nisqually Indian Tribe participating in pre-construction site surveying in 2017. No response from the Confederated Tribes of the Chehalis Reservation has been received to date. Because the authorization of Project siting and construction are under the jurisdiction of the local land use permitting authorities (Lewis and Thurston counties), these entities are responsible for ensuring there is appropriate coordination and consultation with potentially affected tribes consistent with Washington Administrative Code 365-196-450.

5.3.11 Transportation

Construction would result in increased traffic on public roadways to the Project Area and on private roads within the Project Area. Construction traffic to the WTG sites would be generally directed from the north towards the south, with construction deliveries entering primarily from the north and west along Gordon Road SE and Thompson Creek Road SE, travelling along existing logging roads to the WTG locations, and then exiting via southeast-bound logging roads to Pigeon Springs Road and Centralia Alpha Road and State Route 508. No changes to public roadways would be required; however, some private roadways within the Project Area would be constructed, and some existing roads may be upgraded. Certain WTG and substation components would be delivered via marine vessel to the Port of Tacoma, which has the capability for these activities and the facilities and yards necessary for the components. No other transportation modes (e.g., rail) would be used.

Approximately 800 weekday daily construction trips are estimated, with 305 trips during the weekday a.m. and p.m. peak hours during the 9-month construction period. It is likely that hauling would occur outside the peak hours and be spread throughout the day. However, construction traffic levels would result in some increases in traffic volumes to the surrounding roadways that may cause vehicle delays to other motorists using construction haul routes. The estimate of construction impacts is conservative and temporary, and scheduling construction hauling outside the weekday peak hours would minimize impacts to the roadway system. In addition, the construction activities will be managed to minimize impacts during the weekday peak commute periods. Construction phasing and site arrivals and departures management will be developed by the contractor.

In addition to increased traffic and delay on public roadways, heavy trucks could result in some damage to roadways and bridges. Most trucks would not exceed the legal load limit of 47,854 kilograms (105,500 pounds; WSDOT 2006), but some could, especially those carrying heavy components and other large equipment. These trucks could degrade the condition of the existing roadways and bridges along the proposed haul route and may require additional axles to distribute the weight of the load. Permits will be obtained for all oversized and overweight vehicles. A final route analysis will be completed once WTG components have been acquired and routes have been reviewed and approved by the Washington State Department of Transportation and the appropriate cities and counties. It is possible that routes other than those currently analyzed could be selected to further minimize impacts.

The impacts resulting from Project decommissioning activities will be similar to those during construction. Mitigation measures implemented during construction will similarly be implemented during decommissioning.

5.3.12 Noise

Construction activities, including the operation of heavy equipment (e.g., trucks, dozers, graders, cranes, portable generators, concrete manufacturing, and haul trucks) and the potential for blasting near some of the proposed WTG sites, would increase noise levels. Table 5.3-2 contains construction noise levels for typical equipment that could be used on this Project at distances of 15.24, 60.96, 152.40, and 304.80 meters (50, 200, 500, and 1,000 feet) from the center of noise source. The construction noise levels were conservatively calculated assuming there are no obstructions (such as trees) that would further lower noise levels and therefore are likely higher than what would be experienced at the distances shown.

Table 5.3-2. Typical Construction Noise Levels

Construction Activity	Construction Equipment	Usage Factor (%)	L_{max} at 50 feet (dBA)	Hourly L_{eq} at 50 feet (dBA)	Activity Total Hourly L_{eq} at Distance (dBA)			
					50 feet	200 feet	500 feet	1,000 feet
Blasting	--	5	94	81	81	69	61	55
Site preparation	Dozer	40	85	81	82	70	62	56
	Compactor	20	80	73				
Foundation	Dozer	40	85	81	85	73	65	59
	Concrete mixer truck	40	85	81				
	Concrete pump truck	20	82	75				
Erection	Crane	16	85	77	83	71	63	57
	Man lift	20	85	78				
	Flatbed truck	40	84	80				

Notes:
Source: USDT 2006
--: not applicable
L_{eq}: equivalent continues sound level
$L_{max:}$ maximum sound level
Usage Factor: percentage of time that the equipment is in use

Noise-generating construction activities, including blasting, would be conducted during the hours between 7:00 a.m. and 6:00 p.m. to the maximum extent possible. Construction activities conducted between these hours are exempt from the limits per Washington Administrative Code 173-60-050. Nighttime construction is not planned for the Project, except that hauling of components to construction sites may be conducted overnight. Consistent with local permitting requirements to be enforced by Lewis and Thurston counties, the Applicant will be required to comply with all applicable noise standards for non-exempt construction periods.

Traffic volumes would increase on local roadways surrounding the Project Area during the construction phase due to commuting construction workers and the transportation of materials. Haul trucks delivering the WTGs will access the Project Area via Vail Loop Road SE and existing private roads and would pass near a few local residences along the route. As a result, noise levels along local roadways would increase temporarily. However, most deliveries and site access trips would occur during daytime hours. Noise impacts associated with Project O&M are addressed in Section 4.13.

Decommissioning activities will be similar in type but shorter in duration compared to those anticipated for the construction phase. This will result in noise levels similar to those experienced during construction.

5.3.13 Public Services and Utilities

Project construction could potentially affect public services and utilities by increasing the short-term demand for emergency responders (such as firefighters and emergency medical services personnel), disrupting the provision of public services and utilities, and increasing the short-term demand for water, energy, and waste management.

Construction activities—including clearing for Project facilities, blasting, and use of flammable materials such as lubricating oils and cleaners—present an increased fire risk and could increase demand for emergency medical services slightly if an accident were to occur at the Project site. While construction is not anticipated to exceed the ability of the local first responders, continued coordination through the implementation of a Construction Phase Emergency Response Plan would help reduce the potential impact.

Due to the remote nature of the Project Area, telephone, water, and community sewer services are not provided in the Project Area. Therefore, there would be no impacts on the supply of these services from utility providers. Buried or aboveground utility lines may be present in less rural locations or along public roads where Project construction activities may occur, and these activities may require temporary interruption of service or relocation of such utility lines.

Up to 20 acre-feet (approximately 1,233 cubic meters or 6.5 million gallons) of water would be consumed during construction. Water would be supplied by the City of Yelm in Thurston County. The City of Yelm has indicated that they have the appropriate water rights and adequate supply to meet the Project's requirements without affecting other users (Bedlington 2017). Electricity required during construction would be provided by on-site generators or temporary service from the local utility distribution system. During construction, the primary wastes generated would be solid construction debris, which would accumulate on site in drop boxes until it was hauled away to a licensed transfer station or landfill by the waste-hauling contractor. Hazardous materials used during construction that require disposal, such as fuels and lubricant oils, would be disposed of in accordance with all applicable state and federal laws and regulations.

At the end of its design life, retrofitting, decommissioning or repowering the Project will generate impacts to public services and utilities similar to those occurring during construction of the Project. These include temporary increases in demand for public services (police, emergency services, and medical services), increased response time for emergency services, and impacts related to wastewater and solid waste generation.

5.3.14 Health and Safety

Construction of the Project would expose construction workers to occupational hazards such as increased risk of harm from electrical hazards, hunting accidents, worker falls when assembling WTGs, and inadvertent hazardous materials releases that could result in fires or explosions.

These risks would be due to the use of construction-related materials and chemicals, operation of heavy equipment, and the use of explosives (i.e., blasting). In addition, workers could be exposed to falling hazards and confined space hazards when erecting the WTGs. Such exposure would be limited to Project construction sites and minimized by mandated adherence to federal OSHA construction standards (29 CFR 1926) and the Washington Industrial Safety and Health Act (RCW 49.17).

Decommissioning activities will result in the same public and occupational health and safety risks associated with Project construction, including potential fire and explosions, electrical hazards, hunting activity, worker falls from WTGs, and an inadvertent hazardous materials release.

5.3.15 Socioeconomics

Project construction has the potential to result in mainly beneficial socioeconomic impacts related to increases in income, employment, and governmental revenues. Potential impacts on population and housing are also addressed.

5.3.15.1 Income

The current (2018) estimate to construct the Project is approximately $235 million.[11] Of the total Project costs, only a portion would go to purchases of supplies and services within the regional study area[12]—a significant amount of the total Project cost would directly be spent outside of the state of Washington because the specialized equipment is not available for purchase locally. The estimated cost of these purchases is about $118 million (excluding taxes). The estimate of local spending (which is defined as spending that occurs within the regional study area, including Lewis and Thurston counties), including site preparation and construction, is around $60 million.

The analysis of the primary and secondary effects of this construction spending estimates that total output, or value of goods and services generated, would be around $89.8 million. The value added, or the amount by which the value of the Project is increased, would be $37.6 million, and the total labor income expected would be $26.7 million. These economic impacts are listed in further detail in Table 5.3-3.

[11] As of the date of preparation, these conceptual estimates are subject to change as planning and design moves forward.

[12] The "regional study area" is defined here as the CSA, which includes the Lewis/Thurston/Pacific counties (where the Project is located) and the counties to the north where the region's economic centers of Olympia, Tacoma, and Seattle are located.

Table 5.3-3. Economic Impacts of Project-Related Construction Spending

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Output	$61,484,462	$11,659,127	$16,691,689	$89,835,278
Value Added	$20,623,034	$6,879,341	$10,076,767	$37,579,142
Labor Income	$16,566,639	$4,532,287	$5,589,716	$26,688,642
Job-Years	300	67	105	472

Note:
Source: ECONorthwest 2018

5.3.15.2 Employment

The Project is expected to employ approximately 300 full-time and part-time workers at some point during the construction period. About half of these workers would come from outside of the regional study area, because they have specialized skills in constructing wind projects and typically travel from project to project. The remaining 150 workers would be drawn from the labor force in the local or regional study area. The Project would support additional job-years (i.e., one full or part-time job for one year) as Project-related spending during construction trickles through the economy of the regional study area. The secondary (indirect and induced) impacts would support approximately 170 additional job-years. Accounting for the direct jobs described above, the total Project-supported temporary employment (i.e., during construction) in the regional study area is likely to between 400 and 500 job-years.

5.3.15.3 Population and Housing

At the peak of construction, approximately 100 workers from outside the region may be employed at the same time and would require temporary lodging accommodation in the general vicinity of the Project Area during the construction period. Demand for temporary lodging could increase by this amount at the peak of construction on weekdays. It is possible that the additional demand for temporary lodging could exceed available supply during the summer months, particularly on peak weekends and holidays. If this occurs, two effects likely would happen: nightly rates would increase above typical levels for the season, and some customary users of local temporary lodging options may be displaced (i.e., they would go elsewhere for accommodations). Both effects would not be expected to result in adverse effects on businesses.

Temporary construction workers will be expected to find lodging throughout the region surrounding the Project Area, however, impacts to recreationalists from temporary workers occupying sites at overnight campgrounds located in the vicinity of the Project are expected to be minimal since no campgrounds are located within a 10-mile radius of the Project.

5.3.15.4 Government Revenue

Based on estimates of Project values, the Applicant estimates that construction expenditures would generate retail sales tax and use revenue of approximately $1.9 million. Based on this number, the state would collect about $1.5 million and local jurisdictions (including Lewis and Thurston counties) would collect a total of about $400,000 (depending on the effective local sales tax and use rate that applies). Additional sales tax revenues would arise during construction from purchases of fuel, lodging, and from indirect and induced purchases subject to the retail sales and use tax. There are insufficient data to estimate these tax collections; however, they will likely be small.

Construction of the Project would involve clearing vegetation from within and adjacent to the WTG footprints, and within the transmission line right-of-way. Most of the area underlying the proposed WTG sites has already been recently harvested and would not generate saleable timber subject to the timber excise tax. However, the Project would result in a net decrease in timber excise tax collections, because trees harvested before their normal harvest rotation of approximately 40 years would be less valuable and generate less tax revenue.

During the decommissioning process, similar impacts to those experienced during construction will occur but to a lesser extent because less construction material will be removed than was delivered to the WTG sites. Socioeconomic impacts resulting from decommissioning will also be similar to those described for construction: activities may generate temporary employment opportunities and may create additional demand for temporary lodging. These impacts are likely to be smaller in scale than those described for construction, and likely will be even smaller relative to the size of the economy assuming current trends continue until decommissioning occurs.

5.3.16 Environmental Justice

As noted in Section 3.17, there is one low-income area near Tenino but no areas with a meaningfully greater proportion of minority populations near the Project Area. As discussed previously, none of the construction related impacts are significant, nor would they disproportionately affect residents near the low-income area. Therefore, construction and decommission is not expected to disproportionately affect minority or low-income populations.

6 Cumulative Effects

This section analyzes the cumulative effects on resources likely to be affected by construction and decommissioning and O&M activities in Sections 6.1 and 6.2, respectively. The Council on Environmental Quality defines cumulative effects as “the impact on the environment which results from the incremental impact of the 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” (40 CFR 1508.7).

As per the Council on Environmental Quality guidelines, resources that would not be impacted by the Action Alternatives, have beneficial effects, or are only subject to temporary effects were excluded from this analysis (CEQ 1997). Based on Sections 4.2 through 4.19, the cumulative effects analysis focuses on mortality associated with collision with human-made structures affecting bird and bat species in the context of other factors known to adversely affect these most susceptible species.

As noted in Chapter 4, construction and decommissioning are proposed to occur prior to issuance of the ITP and therefore could occur as part of the No Action Alternative or the Action Alternatives. Therefore, Section 6.1 describes the potential for these activities to result in cumulative effects irrespective of Action Alternatives. Similarly, because the Action Alternatives result in minimal differences in impacts from O&M activities, which on a cumulative basis would be even more muted, Section 6.2 uses the best available information to address the potential for impacts under Alternative 1 to support a relative comparison of the potential for effects related to Alternatives 2 and 3.

6.1 Construction and Decommissioning

6.1.1 Past, Present, and Reasonably Foreseeable Actions

Urbanization and other human activity involving land alteration near the Project Area are largely centered around the cities of Centralia and Chehalis and along the I-5 corridor. Development began in the late 19th century. Historic industry was largely timber related and included timber harvesting and milling, with peak activities generally observed between 1960 and 1980. Agriculture is another common land use of the area. Other major industrial facilities developed near the Project Area include a coal mine (now closed and being reclaimed), a power plant, and the Skookumchuck Dam, which provided water to both industrial and residential users in the area.

The western portion of the Project Area, including the Tono substation and ports of the gen-tie line, are located in areas historically used for industrial purposes, including mining, power plants, forestry, and other manufacturing. Rural residential and agricultural areas are also present.

Present activities near the Project Area reflect the various existing land uses present in both Thurston and Lewis counties. Building permits issued in 2016 indicate both counties are continuing to grow and develop (U.S. Census Bureau 2016). Commercial forestry remains the predominant activity within the Project Area and in immediately adjacent and surrounding areas. Power generation activities additionally occur near the Project Area at the Central Coal Plant and Chehalis Generation Facility.

Foreseeable future development near the Project Area are likely to include the continuation of past and present activities associated with forestry uses, additional rural residential development outside of urbanized centers, and residential and commercial development within and around

urbanized centers, according to the Lewis, Thurston, and Pacific county comprehensive plans and current zoning designations. The following projects in the vicinity of the Project Area have been identified because they are substantial developments; however, they would not be expected to significantly alter the status of the Covered Species:

- The North Lewis County Industrial Access Project aims to create 1,000 new manufacturing jobs in Lewis County by 2030. The study is examining ways to improve access to industrial properties and improve the mobility of people and goods through the area. Construction and operation of projects are not yet identified at this time.
- The Yelm-Tenino Trail would provide a paved, 14-mile recreational trail connecting Yelm and Tenino. Three phases of construction are proposed and would include the development of paved trail surfaces, signage, parking areas, basic trailhead facilities and bathrooms, and trestle reconstruction.
- Transportation system improvements are ongoing throughout the region. However, no projects are currently proposed within the immediate vicinity of the Project Area.
- The Chehalis Basin Study aims to reduce flood damage and restore aquatic species habitat in southwestern Washington. The Chehalis Basin Study-proposed improvement activities near the Project Area are focused on fish passage improvements and would be limited in footprint and scope and take place at a lower elevation than the immediate Project Area. Alternative actions are currently being considered, but a time line for improvement projects has not yet been determined.

Additionally, future energy development may take place in the surrounding area. The Coyote Crest Wind Park is located in Lewis, Pacific, and Grays Harbor counties on commercial forest land, with no time line for construction currently. The Tono Solar Project in Thurston County is scheduled to begin construction in 2019 on reclaimed mine land. The Centralia Coal Plant is planning to retire existing coal-fired burners in 2020 and 2025 and is expected to propose methods for replacing the baseload energy production.

6.1.2 Geology and Soils

The Project would not result in any measurable changes to geology as disturbance would be limited to surface disturbances related to Project construction of facilities and roads. Cumulatively, the largest change to geology is the reclaiming of the closed coal mine. No cumulative effects are anticipated from this Project when combined with other past, present, or reasonably foreseeable projects. Soil erosion is addressed in Section 5.3.17.3.1. Soil compaction would occur in areas permanently developed for Project facilities (i.e., yards associated with the structures, segments of new or improved access roads, and aprons surrounding the WTGs). This compaction would be limited to individual Project locations.

On a cumulative scale, although the impacts resulting from construction of the Project and other existing or reasonably foreseeable projects would cumulatively increase permanent ground disturbance, the impacts of each proposal would be limited to its footprint and immediate vicinity. All projects considered together would not cause any appreciable cumulative impacts to earth resources. Impacts would also be spread over time given that the area is not experiencing rapid growth and only one other proposal has been constructed in the past.

6.1.2.1 Erosion Hazard

Soil erosion and compaction are typically limited to the footprint of development, but broader-scale soil erosion can also occur as a result of long-term land use changes (e.g., historical conversion of natural lands to farming). Project construction could result in erosion impacts; however, the Applicant, and any other proponents of new development, would be required to comply with local, state, and federal requirements to minimize erosion resulting from stormwater exposure. All reasonably foreseeable actions would be constructed in compliance with the applicable requirements of the *Stormwater Management Manual for Western Washington* (Ecology 2014) and any additional local regulatory requirements, thereby minimizing this cumulative impact. The *Stormwater Management Manual for Western Washington* (Ecology 2014) includes several recommended practices during development of a SWPPP to consider the cumulative potential for erosion and stormwater runoff that could result from several individual/unrelated sources located in proximity to one another.

6.1.2.2 Landslide Hazard

Certain Project WTGs and access roads will be constructed in locations identified as having high susceptibility to landslides. Such locations could be in close proximity to existing and actively used logging roads. Improper installation of Project facilities, when combined with the nearby and concurrent use of logging roads and associated soil disturbances, could result in exacerbating landslide potential at these locations. As noted above, Project facilities would be constructed in accordance with the requirements of applicable land use planning requirements, including critical areas ordinances. Hazard assessments and geotechnical borings will be conducted at locations susceptible to landslide and final topography designed to minimize the potential for future landslides in these locations. As other projects and developments would not be constructed on the same landslide-susceptible areas, there is no cumulative impact from these projects.

6.1.2.3 Mine Hazard

The Project does not involve mining. If Project activities are undertaken where previous mining occurred, the activities may be subject to public review through the Office of Surface Mining Reclamation and Enforcement or other state or local agencies. There will not be any cumulative mine hazard impact.

6.1.2.4 Seismic Hazards

Construction of the Project, or other reasonably foreseeable construction actions, would not increase the risk or probability of a seismic event.

6.1.2.5 Volcanic Hazards

Construction of the Project, or other reasonably foreseeable construction actions, would not increase the risk or probability of a volcanic event.

6.1.2.6 Channel Migration Zones

The Project will not involve construction of structures within channel migration zones; therefore, there will not be any cumulative impact.

6.1.2.7 Air Quality

Air emissions generated by Project construction activities include exhaust emissions from construction equipment and vehicles, fugitive dust particles from ground disturbance, and use of a portable concrete batch plant and rock crusher. These emissions would have a cumulative impact on the surrounding airshed in the event of other reasonably foreseeable projects beginning construction at the same time; however, the projects are not anticipated to be constructed concurrently, and the Project is geographically removed from the locations of existing or future reasonably foreseeable projects. Therefore, air quality will not be impacted cumulatively.

6.1.2.8 Water Resources

Effects to water resources as a result of cumulative impacts may include effects to surface waters, water quality, stormwater runoff, and groundwater, primarily associated with ongoing commercial forestry practices in the Project Area. Past and present development, including forestry practices, has cumulatively caused adverse impacts to streams and water bodies related to stream buffer impacts, channelization, erosion, and filling. Although the project has been designed and sited to avoid impacts to water resources to the greatest extent feasible, reasonably foreseeable future actions, including continued forest harvesting practices, may contribute to cumulative impacts in any given watershed.

Long-term adverse cumulative impacts to water resources could occur as a result of increased impervious areas—from the Project and other cumulative projects. The cumulative increase in impervious surfaces could increase the amount of stormwater runoff; however, the total increase in impervious surface from Project construction is minimal, and the effects are expected to be sufficiently managed by erosion and stormwater control best management practices.

6.1.2.9 Vegetation and Wetlands

Past and present land practices, including timber harvesting, agriculture, and industrial and residential development have altered vegetation and habitat types in the Project Area and in

adjacent and surrounding areas, resulting in cumulative impacts on vegetation and wetlands. Historically old-growth forested land has either been converted to non-forested areas or has been generally altered with decreased stand age, changed stand structure and complexity, increased patch sizes, and altered species distribution. Reasonably foreseeable future actions would continue perpetuating past trends and contributing to forest fragmentation.

Given the present cycles of clear-cutting and reforestation on and around the Project Area, construction activities would contribute incrementally, though in a relatively minor and temporally limited way, to cumulative impacts. However, following Project decommissioning, the land may be returned to commercial forestry. Because the removal of forest vegetation is temporary, the Project will not contribute to cumulative loss of vegetation and wetlands in the long term.

6.1.3 Fish and Wildlife

6.1.3.1 Terrestrial Wildlife Species

Some terrestrial wildlife species may be disturbed by Project construction activities or avoid the Project Area temporarily during construction; however, the construction activities associated with the Project are consistent with the existing timber activities on site to support silvicultural operations. Project construction activities would thus contribute temporarily to cumulative impacts on terrestrial wildlife species and their habitat. The proposed road work within the Project vicinity may also cause temporary increases in impacts from construction activity disturbance and permanent impacts associated with road-wildlife interactions. Reasonably foreseeable future actions involving road improvements, residential, commercial, agricultural, and other development and logging are expected to incrementally add to cumulative impacts to the degree that they are conducted in habitats used by terrestrial wildlife species.

On a broader regional scale, construction of the Project and other existing or reasonably foreseeable wind energy projects could cause impacts to terrestrial species, given that similar habitats would be affected on commercial forestry lands. For large, wide-ranging species the Proposed Action and other wind energy projects could potentially cause short-term impacts to populations of such species at different times and locations or long-term cumulative impacts related to population connectivity. However, most large, wide-ranging species acclimate to these types of projects after construction, so the impact would primarily be temporary. Decommissioning of wind energy projects could potentially increase or decrease cumulative impacts depending on subsequent concurrent activities but would be similar to construction impacts.

6.1.3.2 Bird and Bat Species

Some bird and bat species may be disturbed by Project construction activities or avoid the Project Area temporarily during construction. Additional activity beyond the disturbances associated with forestry activities currently occurring on site are associated with Project

construction and decommissioning would contribute an incremental, though temporary, cumulative impact on bird and bat species and their habitat. Reasonably foreseeable future actions involving road improvements and residential, commercial, agricultural, and other development are expected to incrementally add to cumulative impacts to the degree that they are conducted in habitats used by bird and bat species.

Because of the variability in species, habitat, and flight patterns on a regional basis, it is difficult to assess potential cumulative impacts of construction of wind power, and other projects, on birds and bats over a large geographic area. Although three other wind power proposals have been brought forward, only two received permits, and of those two, only one was constructed. If the other two projects are constructed, construction will occur in a different place and time. No additional information has been provided to incorporate into this analysis. Therefore, construction of regional wind power projects would contribute incrementally, though in a localized way, to the cumulative impact on bird and bat species in the region.

6.1.3.3 Fish Species

Past development and other activities have had an impact on fish species, including the alteration and loss of their habitat in the general Project vicinity. During construction, the Project will implement mitigation measures to protect fish and other aquatic species from stormwater runoff-related water quality impacts. Other foreseeable actions would also be subject to similar mitigation measures. Therefore, permanent cumulative impacts from construction are not anticipated.

The proposed road work within the Project vicinity may cause temporary increases in impacts from construction activities. These impacts are anticipated to continue into the foreseeable future but would also be required to implement stormwater mitigation measures to prevent water quality impacts to aquatic species from runoff. Therefore, construction activities associated with wind energy projects and supporting infrastructure in the region in general, and the Proposed Action in particular, would not contribute permanent cumulative impacts to fish species.

6.1.4 Rare, Threatened, and Endangered Species

6.1.4.1 Marbled Murrelets

As discussed in Section 5.3.6.1, as the Project facilities are erected, there is a chance for collisions with non-operational WTGs and meteorological towers. Risk of collision with other facilities, such as the transmission line, during construction are also possible. Based on the best available information, the disturbance related to increased traffic and activity during construction and decommissioning activities are expected to cause an incremental, temporary increase to cumulative impacts on marbled murrelets.

6.1.4.2 Bald and Golden Eagles

As discussed in Section 5.3.6.2, the numbers of bald eagles within 2 miles of the Project site are low. Bald eagles normally seen at the site would likely avoid the additional activity and traffic associated with construction activity. This could potentially result in a temporary incremental increase to cumulative impacts on bald eagles. Because of the large range of bald eagles, construction of wind power projects in the range of the LAPs would contribute incrementally to the cumulative impact on bald eagles in the region.

Since golden eagles are less prevalent in and near the Project Area and the habitat in the Project Area is not preferred, the potential for increased cumulative impacts to golden eagles at the Project Area or regionally is low.

6.1.4.3 Other Special Status Species

As discussed in Section 3.6.2 and 3.6.3, pileated woodpecker, Vaux's swift, and Townsend's big-eared bat have been documented at the Project site and are at risk for permanent habitat loss or mortality from Project construction. These species may also be disturbed from normal use of the Project site during construction activities. Therefore, there is expected to be an incremental increase in cumulative impact to these species locally associated with Project construction. Because pileated woodpecker, Vaux's swift, and Townsend's big-eared bat occupy a smaller range, construction of regional wind power projects is not likely to affect the same populations of these species.

No individuals of northern goshawk were observed within the Project Area, though the potential for short-term foraging or migrating at the Project site exists. As a result, cumulative impacts to this species related to construction are expected to be minimal.

6.1.5 Land Use and Recreation

Construction of the Project will be consistent with existing land use planning and zoning designations for Project facilities and will not result in any inconsistencies with existing or planned adjacent land uses. Project construction will also have little or no effect on existing land use patterns but could temporarily disrupt ongoing commercial forestry activities occurring adjacent to Project facilities. Project construction will have little to no permanent impact on recreation resources. Given the abundant recreational resources in the area and the low level of impacts, the Project's contribution to cumulative impacts to recreation would be minor. Reasonably foreseeable actions would also be required to comply with land use ordinances and zoning, and impacts to recreation areas would need to be considered prior to construction. Planned cumulative impacts from Project construction include increased traffic and service usage in the area.

6.1.6 Visual Resources

Views of construction activities would primarily occur as a result of transit of large construction equipment and other supplies on public roads but would be limited to viewers who travel on those roads. Active construction is less likely to be visible where it occurs away from roads, except in areas where existing timber harvest practices have created view corridors to parts of the construction site. Future clear-cutting could change or increase views to the gen-tie line or WTGs during operation. Other reasonably foreseeable projects could be constructed; however, these actions would occur at other locations and are unlikely to result in a cumulative impact to viewers.

Operation of the Project may affect visual resources in a larger area due to the size and position of the WTGs; however, the mountainous terrain and existing vegetation would limit the level of impact to visual resources. Lands surrounding the Project Area are rural and sparsely populated such that the cumulative impacts to visual resources are low.

6.1.7 Cultural and Historic Resources

Cumulative effects to cultural and historic resources may occur as a result of past, present, and future activities, including residential development and forest harvest practices. Effects to cultural and historic resources could occur as a result of construction or decommissioning where ground-disturbing activities will take place, as discussed in Section 5.3.9. Surveys for sensitive cultural resources were previously performed, and an Inadvertent Discovery Plan would be implemented to address any archaeological resources uncovered during construction or decommissioning. The Project has been designed in a manner to avoid adversely affecting areas that are potentially eligible for inclusion in the NRHP; however, any future actions that result in additional ground disturbance could contribute to cumulative effects to cultural and historic resources. Prior to any future actions, investigation for possible disturbance of cultural and historic resources must be completed; therefore, cumulative impacts to these resources are considered avoidable.

6.1.8 Tribal Resources

Effects to tribal resources are addressed in Section 5.3.10. Additional consideration for tribal resources would be dependent on future tribal consultation for site-specific and Project-specific conditions.

6.1.9 Noise

Cumulative effects to noise are not anticipated, as noise emissions from reasonably foreseeable actions would need to occur within the same general area and at the same time as the Project. The Project may contribute to slightly elevated noise levels as a result of increased road traffic during construction and decommissioning, but no long-term cumulative effects would occur. Other reasonably foreseeable actions are located at a distance where noise levels would attenuate

to background levels before combining with Project noise levels. Cumulative impacts related to noise are therefore not expected to occur.

6.1.10 Public Services and Utilities

Public services and utilities may be affected by cumulative impacts of the Project but are not expected to exceed the capacity for any service or utility. Compared to baseline conditions, construction activities or decommissioning could increase the potential need for fire protection, law enforcement, or medical services; however, this increase is expected to be low to moderate. Reasonably foreseeable actions in the Project vicinity include ongoing commercial forestry practices, for which the cumulative impact is not expected to be significantly higher.

6.1.11 Health and Safety

During construction of the Project, there could be a slight increase in risk of traffic or worker accidents during the construction period. This impact would take place in the background of existing land use patterns based on commercial forestry and industrial and residential development. Given the low anticipated number of incidents and the available capacity of the local emergency responders and hospitals to respond to those incidents, the cumulative impact would be relatively minor and would be reduced once construction is completed. On a broader regional scale, although other existing or reasonably foreseeable proposals would result in similar impacts to those discussed for the Proposed Action, these impacts would occur in different locations and would not result in cumulative impacts for any specific residences or emergency service providers. Response to regional fire incidents can result in emergency providers from one fire district temporarily providing assistance to another district through mutual aid agreements. However, adverse impacts to service providers would only occur if response was needed for a region-wide event; in such cases, broader intervention by state and out-of-region local resources would be coordinated.

6.1.12 Socioeconomics

Cumulative socioeconomic impacts may occur when more than one future foreseeable project has an overlapping construction schedule that creates a demand for workers that cannot be met by local labor, resulting in an influx of non-local workers and their dependents and resulting in excessive demand on public services.

The Tono Solar Project is the only future foreseeable project with a construction schedule that could overlap with the Project and thus compete with the Applicant for skilled labor. However, since the construction schedule for both the Tono Solar Project and the Project are relatively short, and the two projects are estimated to collectively employ less than 1% of the regional workforce, half of which would likely already reside within commuting distance, no adverse impact to local schools, housing, and public services are anticipated. Additionally, about half of

the employment workforce for the Project is assumed to be specialized/skilled laborers who would temporarily relocate from outside of the regional study area; a lack of these skilled workers is not anticipated to occur because employment needs for both projects combined would represent a very small fraction of the total available skilled workforce nationwide.

Socioeconomic impacts to the area will largely be beneficial but will not dramatically alter the area as a result of the Project and will not contribute to any cumulative socioeconomic impacts because all other planned and future projects would result in similar minor beneficial impacts that would not dramatically affect the overall socioeconomic environment. Therefore, no cumulative impacts to socioeconomics are anticipated from construction or decommissioning.

6.1.13 Environmental Justice

As discussed previously, none of the construction-related impacts are significant, nor would they disproportionately affect residents near the low-income area. Therefore, construction and decommission are not expected to result in cumulatively significant disproportionately affect minority or low-income populations in the immediate vicinity of the Project.

6.2 Project O&M

6.2.1 Non-Listed Bird and Bat Species

6.2.1.1 Geographic and Temporal Scale and Types of Impacts

The study area for the cumulative effects analysis of non-listed bird and bat species is the same as described in Section 3.6 and includes the Cascades Ecological Region (Level III ecoregion), extending from the central portion of western Washington to the south through the Cascade Range of Oregon, and a disjunct area around Mt. Shasta in northern California (USEPA 2013). The analysis of cumulative effects addresses how the Action Alternatives would contribute to broader effects on bird and bat species from Project O&M within this larger area.

6.2.1.2 Habitat Loss and Fragmentation

Urbanization and other human activity over time has resulted in older forest habitat losses for a variety of wildlife, including bird and bat species, that has in some cases contributed in part to population declines for bird and bad species of concern that rely on these habitats (e.g., northern goshawk, Townsend's big-eared bat, and pileated woodpecker). Within the Study Area, timber harvest in particular has also played a major role in habitat loss within forested areas over time.

Urbanized uses near the Project Area have largely centered around the cities of Centralia and Chehalis and areas along the I-5 corridor, with development beginning in the late 19th century. Historical industry was largely timber-related and included timber harvesting and milling, with peak activities generally occurring between 1960 and 1980. Other major industrial facilities

developed in the region included a coal mine and power plant, as well as the Skookumchuck Dam, which provided water to both industrial and residential users.

Present activities near the Project Area reflect the various existing land uses present in both Thurston and Lewis counties. Both counties continue to experience growth and development, as evidenced by the number of building permits issued in 2016 (U.S. Census Bureau 2016). Foreseeable future development near the Project Area and conservation lands are likely to include the continuation of past and present activities associated with forestry uses, additional rural residential development outside of urbanized centers, and residential and commercial development within and around urbanized centers, according to the Lewis, Thurston, and Pacific county comprehensive plans and current zoning designations. Various types of smaller local residential, commercial, and industrial land use proposals may occur within the cumulative impact study area and occur concurrently with Project development; however, the impacts of such activities are expected to be limited to their immediate vicinity.

6.2.1.3 Wind Energy Development

In particular, wind energy development has also affected bird and bat populations from increased mortality as a result of collision. Recent estimates indicate there are 70 operational facilities in Washington and Oregon with 18 approved and another dozen or so proposed or in permitting (Renewable Northwest 2018), including Coyote Crest Wind Park, proposed in Lewis, Pacific, and Grays Harbor counties (Scheibmeir 2010; Lewis County 2010). Over the term of the ITP, it is possible that additional facilities could become permitted and constructed; however, while growth in the wind sector has been rapid over the previous few years, the U.S. Energy Information Administration energy forecasts recently indicated a nationwide growth rate of 2.4% annually for installed wind energy capacity between 2015 and 2040 (USEIA 2015). Across the United States, wind-farm related avian mortality is estimated at 600,000 to 13.2 million birds per year (Service 2018f).

For additional context, about 3,075 MW of wind power were generated in Washington state in 2015 (WECC 2016). With estimates between 1.6 and 1.7 bat fatalities per MW per year (NWCC 2004; Arnett et al. 2008), approximately 5,227 bats are killed annually in Washington state. This could result in over 150,000 bat fatalities over the course of the 30-year analysis period unrelated to Project O&M. Although many of the affected bat species are not listed as threatened or endangered, they have low reproductive rates typical of long-lived species, and significant impacts to their numbers is not considered sustainable over time.

6.2.1.4 Anthropogenic Sources of Mortality Other Than Wind Farms

Other sources of mortality affecting bird and bat species include collisions with aircraft, vehicles, buildings, high tension lines, and communication towers. In addition, avian species are susceptible to predation by feral and domestic house cats, poisoning from pesticides and other

hazardous materials, electrocution, legal harvest, and oil pits. Table 6.2-1 summarizes annual avian mortality levels from anthropogenic sources in the United States because this information is not available for the cumulative effects study area.

Table 6.2-1. Anthropogenic Mortality Sources

Mortality Source	Estimated Annual Mortality	Estimated Mortality over the 30-Year Permit Term
Depredation by domestic cats	1.4 to 3.7 billion	42 to 111 billion
Collisions with buildings (including windows)	97 million to 1.2 billion	2.9 to 36 billion
Collisions with power lines	130 to 174 million	3.9 to 5.2 billion
Legal harvest	120 million	3.6 billion
Automobiles	50 to 100 million	1.5 to 3 billion
Pesticides	67 to 72 million	2 to 2.1 billion
Communication towers	4 to 50 million	120 million to 1.5 billion
Oil pits	1.5 to 2 million	45 to 60 million
Wind turbines	20,000 to 440,000	600,000 to 13.2 million
Total mortality	**1.9 to 5.2 billion**	**57 to 156 billion**

Note:
Sources: Service 2002; Erickson et al. 2005; Thogmartin et al. 2006; Dauphiné and Cooper 2009; Manville 2009; Loss et al. 2013.

In recent years, white-nose syndrome (WNS) has emerged as the largest single source of mortality for cave-hibernating bats in recent years. WNS has been confirmed in 31 states, including Washington, and five Canadian provinces (Service 2017b). WNS has not yet been documented for migratory tree-roosting bats (e.g., hoary bat, silver-haired bat). A general discussion of these trends and the impacts within the United States can be found in the recent MidAmerican HCP EIS (Service 2018f). As noted, WNS impacts may be severe for cave-dwelling bats, which would make additional mortality from other sources (such as wind energy facilities) more significant, though they may also decrease the probability of collision mortality due to decreased population sizes.

6.2.1.5 Climate Change

Climate change will also affect wildlife species from changes in temperature and precipitation and secondary factors, including changing habitat, sea level rise, changes in predation, competition, and dispersal, and migratory changes (Audubon 2015). In the Pacific Northwest, coastal waters are also vulnerable to acidification, which can adversely affect the marine ecosystem. Over half the 588 birds studied by the Audubon Society are likely to be affected by climate change, losing more than half their current geographic range (Audubon Society 2015).

Climate change is expected to affect bats through droughts, causing higher mortality (O'Shea et al. 2011; Frick et al. 2010) but may also lead to increases in foraging areas through increased precipitation, which may also increase prey availability for insectivorous species (Moosman et al. 2012).

6.2.1.6 Summary of Cumulative Effects on Non-Listed Bird and Bat Species

The Action Alternatives would result in increased risks of mortality from WTG collision with Alternative 1 resulting in the greatest risks, followed by Alternatives 2 and 3, as discussed in Section 4.6. Sources of anthropogenic mortality for birds and bats overwhelm the incremental effects of the Project (Table 6.2-1). For many common species, this level of mortality would not significantly affect the ability of the larger population to survive even in the face of other stressors discussed previously. For rare species, mortality caused by the Action Alternatives could result in a more significant impact to long-term viability of the species, particularly when considered in the context of potential impacts associated with other stressors, including loss of habitat, habitat fragmentation, and climate change effects.

6.2.2 Marbled Murrelet

The major cause of marbled murrelet population declines over the past century has been the loss of nesting habitat, due primarily to logging, fire, and windstorms (Falxa and Raphael 2016). In the 20 years following the start of the Northwest Forest Plan, marbled murrelet subpopulations in Washington experienced the greatest rates of decline, compared to Oregon and California (Desimone 2016). Murrelet population size is strongly correlated with the availability of unfragmented forest stands containing suitable nesting habitat, and Washington experienced the highest rates of nesting habitat loss over the corresponding 20 years.

Habitat loss within Washington has been primarily due to historical management of forestlands. Very few late-stage forests are present on these lands. However, approximately 20% of remaining marbled murrelet nesting habitat in Washington occurs on private lands in highly fragmented small patches. Habitat models based on remote-sensing data indicate most of this remaining habitat is confined to areas associated with known occupied nesting sites, riparian corridors, unstable slopes, and other areas deferred from harvest through existing HCPs or other Washington forest practice rules (Desimone 2016). Habitat fragmentation has also affected species distribution with greatest habitat loss in southwest Washington and the now-urbanized lowlands near the coast, resulting in birds flying long distances to get to nesting habitat. Nesting marbled murrelets in Washington already travel long distances between their nest sites and at-sea foraging areas, likely at a large energetic cost (Lorenz et al. 2017). Shifts in productive foraging locations may make traveling between nest sites and foraging areas prohibitively difficult, limiting the ability of marbled murrelets to attempt breeding.

Future forest management in Washington is expected to vary according to differing management practiced on private, state trust, and federal forestlands. Private and commercial forest land is expected to continue to be managed on 40- to 50-year rotations, with little likelihood of providing suitable nesting habitat. However, federal reserves in Washington, which account for 31% of total land area within marbled murrelet range and 66% of the total estimated nesting habitat (Falxa and Raphael 2016), are expected to provide increasing amounts of habitat in the future, playing the primary role for the conservation and recovery of the marbled murrelet in the state (Desimone 2016). Current estimates indicate over approximately 43% of forest on federal land is young but likely to transition into habitat over the next 50 to 100 years (Falxa and Raphael 2016). Some forest land is likely to be converted for homes and businesses. Washington's human population grew 1.34% in 2015, and the state is expected to continue growing in the future. Though land conversions from forest land to residential property typically do not convert much marbled murrelet habitat, development may occur in some nearby areas, reducing existing habitat effectiveness (Desimone 2016).

At the broader scale, the most recent population estimate for the entire Northwest Forest Plan area in 2016 was 22,600 murrelets (95% confidence interval: 18,200 to 27,100 birds) (Pearson et al. 2018). The long-term trend derived from marine surveys for the period from 2001 to 2016 indicate that the murrelet population across the Northwest Forest Plan area has increased at a rate of 0.15% per year (Pearson et al. 2018). While the overall trend estimate across this time period is slightly positive, the evidence of a detectable trend is not conclusive because the confidence intervals for the estimated trend overlap zero (95% confidence interval: -1.2% to 1.5%) (Pearson et al. 2018).

6.2.2.1 Wind Energy Development

Although a leading cause of mortality for marbled murrelets is predation of young at nests (Hamer and Nelson 1995), anecdotal evidence suggests that collisions with stationary and moving objects also results in mortality. One occurrence of a fatality was reported at the Cape Scott Wind Project in British Columbia, Canada, in spring 2015 (Cooper Beauchesne and Hemmera Envirochem, Inc. 2016). Several additional anecdotal reports attribute the cause of mortality to collision with other anthropomorphic structures (Nelson 1997).

Continued operation of existing wind farms, mainly along the coast would be expected to cause collision-related mortality over the 30-year analysis period. In addition to the proposed Project and existing CCPA facility located in Pacific County, the Coyote Crest Wind Park would be located in Lewis, Pacific, and Grays Harbor counties. That project, as permitted but not yet constructed, proposes to develop 47 WTGs generating approximately 120 MW (Scheibmeir 2010; Lewis County 2010).

Because marbled murrelets have a long lifespan and a low reproductive rate, mortality of a single bird can have expanded effects on future populations. Although it is not possible to quantify the impacts associated with all wind facilities in the study area, it is possible that continued wind development could have more significant impacts on the species.

6.2.2.2 Anthropogenic Sources of Mortality Other than Wind Farms

Other known factors adversely affecting marbled murrelet include predation, changes in marine forage conditions (prey species), and post-fledging mortality due to a variety of sources, including fisheries bycatch, derelict fishing nets, and oil spills (Desimone 2016). For example, marbled murrelets are vulnerable to oil spills, experiencing impacts related to reduced reproductive success, loss of foraging area, and mortality. Impacts have been particularly severe in Prince William Sound in Alaska, western Washington, and central California (Carter and Kuletz 1995). However, gillnet fisheries pose the greatest threat to the species in the marine environment. Additional information on these stressors and the contribution to the species decline are discussed further in the Final Rule (61 Federal Register 102). Given the declining population numbers for the species in the study area, although it is not possible to quantify the impacts associated with all anthropogenic sources of mortality over the course of a year, it is likely the cumulative effect of these activities continues to contribute to a significant effect on the species over the course of the 30-year analysis period.

6.2.2.3 Climate Change

Climate change is also likely to alter forest and marine ecosystems, potentially negatively impacting habitat for marbled murrelet. More specifically, marine conditions may be altered as the result of harmful algal blooms, reduction in dissolved oxygen, and reduction of prey availability and quality. Climate change is also likely to increase threats to the species and to nesting habitat, including an increased likelihood of drought-related fire; mortality; insects; tree disease; and extreme flooding, landslides, and windthrow events. Marbled murrelet foraging habitat is also likely to be affected by climate change (Kliejunas et al. 2008, as cited in Service 2018f; Desimone 2016).

6.2.2.4 Summary of Cumulative Effect to Marbled Murrelet

To provide an understanding of the potential effects of Alternative 1 at the population level, the Applicant completed a population viability analysis (PVA). The details of this analysis are presented in Section 5.1.3 and Appendix E of the HCP and summarized in the following text.

The PVA considered the output of four separate models to determine effects of Alternative 1 on modeled future population in Zones 1 and 2, Washington State (Zones 1 and 2 together), and the population within the Northwest Forest Plan area (Zones 1 through 5), which includes the combined population of Washington, Oregon, and northern California. (Zone 6, in central California, was not included.) The models accounted for demographic and environmental effects

unrelated to the Project, such as natural birth and death processes and the effect of other environmental risks (such as those discussed previously) over time, in order to assess the extent to which Alternative 1 could affect the populations in these four geographies.

The PVA did not include the beneficial effects of minimization or mitigation measures, which were modeled separately (see Chapter 6 of the HCP). Based on the PVA, the Applicant determined the effect of take without curtailment or mitigation to be moderate. In general, when the population was exposed to the level of take requested under Alternative 1, populations in all four geographies studied reached quasi-extirpation thresholds, or the point where the population was considered to be at risk, more quickly. In other words, populations for all geographies, which were already in decline, declined more quickly as a result of Project O&M, with populations in the smaller geographies (e.g., Zones 1 and 2 versus Zones 1 through 5) being more greatly affected.

Overall, implementation of the conservation measures described in Section 2.3.2 are intended to reduce the adverse effects to the species associated with Alternative 1. These activities are consistent with the broader goals for species recovery through protecting existing murrelet habitat at sea and in conservation of terrestrial breeding habitat (Service 1997). Removal of derelict nets from foraging habitat will prevent some marbled murrelet mortality, and the individual marbled murrelets that otherwise would have died will instead go on to contribute to the population. In addition, removal of nets from marine foraging areas would prevent the death of marbled murrelets for the entire time the nets would otherwise remain in the water entangling marine animals, not only for the 30-year permit term. Protection of nesting habitat enables its continued use for reproduction; without protection, all but small fragments of the conservation lands would eventually be harvested, rendering the fragments of protected nesting habitat highly vulnerable to nest predation and windthrow. With protection, surrounding habitat will be allowed to grow into an effective buffer against predation, windthrow, and negative microclimate effects, rendering the habitat more productive over time. In addition, the conservation lands are close to the coast, and marbled murrelets using these habitats have a short nest-to-sea commute distance compared with other murrelets in Washington, potentially leading to greater productivity from nests located there. The conservation lands are located in an area where conservation of privately owned forest land is very important to the distribution of marbled murrelets, due to the proximity to marine foraging areas, lack of nearby federally managed land, and high historical usage of nearby areas by nesting marbled murrelets. The conservation lands would be protected in perpetuity and would continue contributing marbled murrelets to the population.

Models of the effects of mitigation show that, under an optimistic scenario, the beneficial effects will fully offset the effects of the permitted take during the 30-year permit term. Although there is uncertainty as to the likely reproductive output of the conservation lands over the 30-year permit term, given that the habitat will be protected in perpetuity, even under a more pessimistic

scenario, the beneficial effects of the mitigation actions will fully offset population effects over a longer period of time, with additional benefits to murrelet nesting habitat distribution.

Because Alternatives 2 and 3 would result in less take, the cumulative impacts of those alternatives would be lower.

6.2.3 Bald and Golden Eagles

6.2.3.1 Geographic and Temporal Scale and Types of Impacts

Consistent with the ECPG, the cumulative effects study area is defined by the LAP around a project site. The bald eagle LAP is the number of bald eagles within 138.4 kilometers (86 miles) of the Project site, and the golden eagle LAP is the number of golden eagles within 175.4 kilometers (109 miles) of the Project site. The LAP analysis is informed by the Service's Bayesian eagle fatality prediction and uses density estimates and mortality numbers generated by its Cumulative Effects Tool at the finest scale available. For bald eagles, that scale is at the EMU level, and for golden eagles, that scale is at the Bird Conservation Region level (Service 2016a).[13]

In the Service's *Programmatic EIS for the Eagle Rule Revision* (Service 2016b), annual take rates of between 1% and 5% of the estimated LAP were identified to be significant, with 5% being the upper end of what would be appropriate to authorize or permit under the BGEPA preservation standard, whether offset by compensatory mitigation or not. Additionally, literature (Service 2016a) suggests that background unpermitted anthropogenic annual mortality of golden eagles across the landscape is equivalent to approximately 10% of the population. Thus, evidence that suggests background levels of unpermitted take within an LAP area may exceed 10% of that LAP may indicate that anthropogenic take is higher than average in the vicinity of the project in question. Therefore, either authorized take greater than 5% of the LAP or unauthorized take that exceeds 10% of the LAP could trigger additional environmental analysis to determine whether issuance of an ITP is compatible with the preservation of eagles.

For bald eagles within the Pacific EMU, the LAP was estimated to be 540 eagles. The 1%, 5% and 10% benchmarks for the Project LAP are approximately 5, 27, and 54 bald eagles, respectively (rounded to whole eagles).

[13] This analysis incorporates both records of federal eagle take permits issued (i.e., authorized take) and unpermitted eagle mortality records that are available to the Service (please note that information on unpermitted take in the Service's database includes law enforcement-sensitive information and thus is not available to the general public). In addition to its own data, the Service reached out to Washington and Oregon state wildlife agencies within the LAP to incorporate eagle mortality records they have that may not be in the Service's database. The Oregon Department of Fish and Wildlife did not have any central data available. The Washington State Department of Fish and Wildlife did have approximately 40 records from 2000 to 2013 that were used in a study of contaminants and golden eagles (Watson and Davies 2015). However, due to limited information on location, it was difficult to determine whether individual records were from the LAP and whether they were already incorporated into the Service's database. To avoid double-counting, the Washington State Department of Fish and Wildlife records were not included.

The LAP of golden eagles occupies the Northern Rockies and Great Basin Bird Conservation Regions. Using densities of each Bird Conservation Region and the proportion of each within the LAP area, the LAP consists of 247 golden eagles. The 1%, 5% and 10% benchmarks for the Project LAP are approximately 3, 12, and 25 golden eagles, respectively (rounded to whole eagles).

The Service's cumulative effects tool was used to complete the LAP analysis, which incorporates records of authorized and unauthorized take and considers the effects along with that estimated to occur as the result of the Action Alternatives. Authorized and unauthorized take unrelated to the Project can occur as the result of various factors, including other wind energy development; other anthropogenic sources of mortality, such as collisions with vehicles or other structures, electrocution, trauma, and poisoning; climate change; and habitat loss and fragmentation. The following sections describe these activities that are likely to affect LAPs. Section 4.20.2.2.6 summarizes the result of the LAP analysis.

6.2.3.2 Wind Energy Development and Other Sources of Authorized Take

The cumulative effects tool analysis identified five known short-term nest disturbance permits, resulting in a projected total of 9.41 annual bald eagle fatalities within the LAP (Service [unpublished]), including the eagles estimated to be taken related to the proposed Project. This level of authorized take would be approximately 1.74% of the LAP, which is below the 5% benchmark.

The cumulative effects tool analysis found there was no authorized long-term or short-term nest disturbance take for golden eagles within the LAP. Of the eight wind projects within the LAP where known take of golden eagles has occurred, two are currently in the process of working with the Service toward long-term take permits. For the purposes of this analysis, the Service is treating the individual wind projects that are currently working toward a long-term eagle take permit and for which an agreement on a fatality estimate has been reached as authorized or "permitted" projects (Service [unpublished]). Based on the projected total of 1.65 annual golden eagle fatalities within the LAP, including the proposed Project, authorized take would be approximately 1.05% of the LAP, which is currently below the 5% benchmark.

6.2.3.3 Other Anthropogenic Sources of Eagle Mortality

From 1997 to 2013, the most common anthropogenic causes of mortality in eagles were poisoning, and gunshot wounds, accounting for approximately 55% of fatalities. Collisions with anthropogenic structures, in comparison, accounted for approximately 9% of total fatalities over the 15-year period (Service 2016a). Tables 6.2-2 and 6.2-3 show the number and cause of unauthorized mortalities that occurred within the LAP for bald and golden eagles, respectively. Based on the records in the Service's eagle mortality database, there were 82 unauthorized bald eagle mortalities and 32 unauthorized golden eagle mortalities within their respective LAPs from 2008 to 2017 (Tables 6.2-2 and 6.2-3).

Table 6.2-2. Known Unauthorized Bald Eagle Mortalities within the LAP (2008 to 2017)

Mortality Cause	All Known	Reported Years	Mortalities Between 2008 to 2017	% of Total
Natural Causes				
Killed/injured by animal	10	2002 to 2015	2	2.4%
Emaciation/Starvation	4	2005 to 2016	2	2.4%
Disease	3	2014 to 2017	3	3.7%
Fall from nest	3	2004 to 2006	0	0%
Drowned	1	2015 to 2015	1	1.2%
Anthropogenic Causes				
Electrocution	37	2001 to 2016	14	17.1%
Shot	12	2004 to 2011	2	2.4%
Collision – Wire	2	2015 to 2016	2	2.4%
Collision – Vehicle	3	2001 to 2013	1	1.2%
Collision	4	2001 to 2015	2	2.4%
Emaciation – Trauma	1	2006 to 2006	0	0%
Poisoned – Pesticide	20	2002 to 2017	2	2.4%
Poisoned – Lead	4	2006 to 2016	2	2.4%
Poisoned	12	2001 to 2009	6	7.3%
Trapped	1	2009 to 2009	1	1.2%
Unknown	46	2001 to 2016	33	40.2%
Trauma	6	2004 to 2015	3	3.7%
Other/Determination Pending	9	2001 to 2016	6	7.3%
Total Unpermitted Take During Discovery			82	
Average Annual Unpermitted Take During Discovery			8.2	
% of LAP			1.5%	

Table 6.2-3. Known Unauthorized Golden Eagle Mortalities within the LAP (2007 to 2018)

Mortality Cause	All Known	Reported Years	Mortalities Between 2008 and 2017	% of Total
Natural Causes				
Emaciation/Starvation	2	2015 to 2015	2	6.3%
Anthropogenic Causes				
Electrocution	2	2002 to 2010	1	3.1%
Shot	1	2007 to 207	0	0%
Collision – WTG	18	2009 to 2016	18	56.3%
Poisoned – Pesticide	1	2014 to 2014	1	3.1%

Mortality Cause	All Known	Reported Years	Mortalities Between 2008 and 2017	% of Total
Unknown	6	2007 to 2016	5	15.6%
Trauma	1	2014 to 2014	1	3.1%
Other/Determination Pending	4	2009 to 2017	4	12.5%
Total Unpermitted Take During Discovery			32	
Average Annual Unpermitted Take During Discovery			3.2	
% of LAP			1.3%	

This analysis was based on eagle mortality records from the Service's database for the most recent 10-full-year period (2008 to 2017). This period was used because it seems likely that annual rates of fatalities by cause and annual rates of reporting those fatalities by cause may have changed over the last half-century. For example, it seems likely that increased knowledge of avian electrocutions and how to reduce their risk may have altered the rate at which electrocutions have occurred over the last half-century. Concurrently, an increased awareness of the issue over the last half-century may have altered the level of reporting of electrocuted eagles. This approach was based on the Environmental Assessment for the 2009 Eagle Act regulations for non-purposeful take, started about 7 to 8 years ago, which included estimates of the existing baseline for eagle populations and existing mortality levels prior to the Service issuing take permits. In addition, there has likely been an increase in reporting of eagle mortalities to the Service since the 2009 regulations went into effect, which provides a more inclusive estimate of eagle mortalities compared to the preceding 20 or 30 years.

An important caveat that comes with the Service's unauthorized take data is that it only includes records of take that have been incidentally discovered and reported. Also, some industries have self-reported incidental eagle mortalities at a higher rate than others, and some types of eagle mortalities (e.g., roadkill) can lend themselves better to incidental discovery and reporting, while mortalities in remote locations are not likely to be discovered. Thus, some causes of mortality, such as poisoning, may be underrepresented in the Service's database; however, this was the best information available regarding eagle mortalities within the LAP.

6.2.3.4 Habitat Loss and Fragmentation

Though bald eagles were once threatened or endangered everywhere in the United States except Alaska, populations have rebounded, and the Service delisted the species in 2007. The number of breeding pairs in Washington State have increased from 398 breeding pairs in 1990 to 848 in 2005 (Service 2018e). Bald eagles are able to tolerate some levels of anthropogenic presence (Buehler 2000), and populations have increased since the 1960s despite habitat loss (Service 2016a). Compared to bald eagles, golden eagle populations appear to be declining slightly across North America, potentially to a new lower equilibrium (Service 2016a). Potential

reasons for this decline are presented in the Service's *Marbled Murrelet (*Brachyramphus marmoratus*) 5-Year Review* (Service 2018g) and in the Draft EIS for the MidAmerican Energy Company HCP (Service 2018f), but habitat loss (and thus degradation of prey populations) have been cited as one of these potential reasons (Kochert and Steenhof 2002; Kochert et al. 2002; Service 2009; Bittner et al. 2012, as cited in Service 2018f).

6.2.3.5 Climate Change

Climate change is likely to exacerbate existing threats to eagles (e.g., invasive plants, disease, habitat loss) and may also alter migration routes, breeding territories, and wintering habitat (Service 2016b). Over the 30-year analysis period, the influence of climate change on eagles is anticipated to intensify and could result in additional unforeseen threats to eagles.

6.2.3.6 Summary of Cumulative Effects on Eagles

The results for bald and golden eagles are shown in Tables 6.2-4 and 6.2-5, respectively. Using only its conservative predictions for permitted projects and records in the Service's database of eagle mortalities (which represent only minimum take rates for each cause of death), the Service calculates approximately 5.79 (2.35%) golden eagle mortalities annually from natural and anthropogenic causes within the LAP (Table 6.2-5). Of these 5.79 annual golden eagle mortalities, approximately 4.39 (2.59 authorized/focal project + 1.8 unauthorized) (1.78%) mortalities were from wind projects, 1.0 (3.1%) were from electrocution, and 1.0 (3.1%) were from poisoning, with the remainder being attributed to a variety of causes or undetermined (Table 6.2-3) but qualitatively described previously.

Table 6.2-4. Projected Annual Authorized and Unauthorized Bald Eagle Take Within the LAP

Source of Estimated Annual Take	Amount of Annual Take	Total Take (30-Year O&M)	% of LAP	Cumulative % of LAP
Skookumchuck Project	4.86	146	0.90%	0.90%
Permitted Projects	4.55	137	0.84%	1.74%
Unpermitted Take	8.2	246	1.52%	3.26%

Table 6.2-5. Projected Annual Authorized and Unauthorized Golden Eagle Take Within the LAP

Source of Estimated Annual Take	Amount of Annual Take	Total Take (30-Year O&M)	% of LAP	Cumulative % of LAP
Skookumchuck Project	1.65	50	0.67%	0.67%
Permitted Projects	0.94	28	0.38%	1.05%
Unpermitted Take	3.2	96	1.30%	2.35%

As shown, the cumulative permitted annual take for bald eagles is 1.74% of the LAP. For golden eagles it is approximately 2.35% of the LAP. Although both are greater than 1% of the LAP and some cause for concern, neither value approaches the 5% benchmark for conducting additional analysis.

The cumulative unpermitted annual take of bald eagles is at least 3.26% of the LAP. For golden eagles, it is at least 2.35% of the LAP. As previously highlighted, these values reflect only eagle mortalities that the Service is aware of. It is probable that some mortalities have gone undocumented within the LAP.

Because Alternatives 2 and 3 would result in less take, the cumulative impacts of those alternatives would be lower.

6.2.4 Other Special-Status Species

6.2.4.1 Past, Present, and Reasonably Foreseeable Future Actions

Pileated woodpecker populations have been significantly impacted by habitat loss through timber harvesting practices such as even-age, short-rotation monoculture forest stand maintenance and general forest fragmentation (NatureServe 2018). Such practices have removed large snags, large decaying live trees, and downed wood, eliminating nesting and roosting sites as well as foraging habitat. However, current forest practices require the retention of a specified number of wildlife trees during timber harvest, which may reduce some of the ongoing impacts on pileated woodpeckers (Larsen et al. 2004). This species is considered relatively stable in Washington State (Sauer et al. 2017).

Because Vaux's swifts frequently nest in cavities created through pileated woodpecker activity, timber harvesting practices that have reduced pileated woodpecker abundance have also negatively impacted Vaux's swift populations (NatureServe 2018; WDFW 2013b). Vaux's swifts additionally use brick chimneys as roosting and nesting sites in more anthropogenic environments; however, these habitats have also been declining as old chimneys are replaced with insulated pipe chimneys. Applications of insecticides near nesting and roosting sites have also diminished Vaux's swift populations, as the species feeds primarily on flying insects within 0.40 kilometer (0.25 mile) of roosting sites (WDFW 2013b). Despite the Priority Habitat and Species Management recommendations for Vaux's swift, which established information on protecting and maintaining habitat and reducing insecticide use (Larsen et al. 2004), the species continues to decline in Washington (Sauer et al. 2017).

Northern goshawk population trends are difficult to determine but have been declining in many parts of North America as a result of habitat alteration. Timber harvest is the principal threat to breeding populations, with relatively long-term impacts observed from removing nest trees and degrading habitat by reducing stand density and canopy cover. Additionally, logging activities

conducted near nests during the incubation and nestling periods can result in nest abandonment (NatureServe 2018). Management recommendations for northern goshawks include setting aside relatively large amounts of land for nesting, post-fledging family areas, and foraging areas. However, intensively managed forest landscapes may continue to diminish suitable home range habitat for this species (Larsen et al. 2004).

The two major contributors to declining population trends in Townsend's big-eared bats are roost disturbance and the closure or reuse of abandoned mines. This species is generally considered highly sensitive to disturbance, and roost sites may severely decline in population or be abandoned upon repeated human visitation. Populations have also been declining due to pesticide application to control moths, a primary source of food for the species, and degradation or loss of foraging and roosting habitat from timber harvest practices and land conversion (WDFW 2013a). This species is covered under the *State of Washington Bat Conservation Plan*, and conservation measures include managing human access to roosts; surveying mines, old buildings, and caves prior to logging or other land disturbance; and limiting the proximity of timber harvest and associated road building to roost sites (WDFW 2013a).

6.2.4.2 Summary of Cumulative Effects on Other Special-Status Species

As discussed in Section 4.7.2.3, populations of sensitive species present in the Project Area are not expected to be significantly affected by any of the Action Alternatives and would therefore not be expected to result in cumulatively significant impacts when considered in the context of the other actions described in this section.

7 Consultation and Coordination

7.1 Scoping

The Service submitted an NOI (83 Federal Register 19569) announcing preparation of the EIS and soliciting public comments, specifically on biological data relevant to the Covered Species; potential collision effects of the Covered Species with stationary objects; potential effects associated with wind facilities; alternatives to the Proposed Action, including avoidance, minimization, and mitigation options; and other current or planned activities in the vicinity of the Project.

The 30-day public scoping period began on May 3, 2018, and lasted through June 4, 2018. The Service received 17 comment letters, which are summarized in the *Final Scoping Report* (Service 2018h). Two letters were received from federal agencies, one was received from a state agency, eight were received from non-governmental organizations, and six were received from the public. Additional information on public and agency involvement is discussed in Chapter 4 of this EIS.

7.2 Draft EIS and Draft HCP Public Comment Period

The Service submitted an NOA (83 Federal Register 61664) announcing the availability of the Draft EIS and Draft HCP and requesting public comments on both documents, specifically on the identification of potential direct, indirect, or cumulative impacts to the human environment; biological information and relevant data concerning the Covered Species; and other wildlife and any other possible reasonable alternatives to the Proposed Action that the Service should consider.

The 45-day public comment period began on November 30, 2018, and lasted through January 14, 2019. The Service received 17 comment letters, which are summarized in the Response to Public Comments (Appendix A). One letter was received from a federal agency, one was received from a state agency, one was received from a business, five were received from non-governmental organizations, and nine were received from the general public.

7.3 Distribution List

- Audubon Society, Black Hills and Willapa Hills Regions
- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Chehalis Reservation
- Confederated Tribes of the Colville Reservation
- Confederated Tribes of the Grande Ronde
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of Warm Springs
- Cowlitz Indian Tribe
- Defenders of Wildlife
- Hoh Indian Tribe
- Jamestown S'Klallam Tribe
- Lewis County, Washington
- Lower Elwha Klallam Tribe
- Lummi Tribe
- Makah Tribe
- Muckleshoot Indian Tribe
- Nez Perce Tribe
- Nisqually Indian Tribe
- Nooksack Indian Tribe
- Port Gamble S'Klallam Tribe
- Puyallup Tribe
- Quileute Tribe
- Quinault Indian Nation
- Samish Indian Tribe
- Sauk-Suiattle Indian Tribe
- Shoalwater Bay Tribe
- Shoshone-Bannock Tribes
- Skokomish Indian Tribe
- Snoqualmie Tribe
- Spokane Tribe
- Squaxin Island Tribe
- Stillaguamish Tribe
- Suquamish Indian Tribe
- Swinomish Indian Tribal Community
- The Nature Conservancy
- Thurston County, Washington
- Tulalip Tribes
- Upper Skagit Indian Tribe
- U.S. Environmental Protection Agency
- Washington Forest Law Center
- Washington State Department of Archaeology and Historic Preservation

- Washington State Department of Ecology
- Washington State Department of Fish and Wildlife
- Washington State Department of Natural Resources

7.4 Estimated Costs of Developing and Producing the EIS

The estimated costs of developing and producing the EIS are provided in Table 7.4-1.

Table 7.4-1. Estimated Costs of Developing and Producing the EIS

Contributor	Draft EIS Cost	Final EIS Cost
U.S. Fish and Wildlife Service	$292,608	$77,394
Contractor	$232,664	$133,350

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Appendix A
Response to Public Comments

1 Introduction

An NOA was published (83 Federal Register 61664) on November 30, 2018, announcing a 45-day public comment period on the Draft EIS and Draft HCP. The comment period lasted through January 14, 2019. This appendix summarizes and responds to the substantive comments received during the public comment period.

Comments were accepted through the Regulations.gov website, by email, by U.S. Postal Service, and at two public meetings held during the public comment period. The open house-style meetings were in Chehalis and Lacey, Washington, with the Service and Applicant present to answer questions about the NEPA process and the Project. Details on those meetings are included in Table A-1.

Table A-1. Draft HCP/EIS Public Meeting Details

Date	Time	Location
December 5, 2018	6:00 to 8:00 p.m.	Veterans Memorial Museum 100 SW Veterans Way Chehalis, Washington 98532
December 10, 2018	6:00 to 8:00 p.m.	South Puget Sound Community College Room 194 4220 6th Avenue SE Lacey, Washington 98503

2 Draft EIS Comment Period Summary

The Service received a total of 17 comment letters, including one from a federal agency (U.S. Environmental Protection Agency), one from a state agency (Washington Department of Fish and Wildlife), one from a business (Renewable Energy Systems, Ltd., which owns the Applicant), five from non-governmental organizations (Willapa Hills and Black Hills Audubon Societies, American Bird Conservancy, Washington Forest Law Center, and Cascade Forest Conservancy), and nine from the general public.

NEPA requires that a federal lead agency consider all comments received during the public comment period and provide a response to all comments that are considered substantive. Substantive comments are those that inform the Service on the information and analysis presented in the Draft HCP/EIS documents or that present reasonable alternatives to the proposed federal action (NPS 2015).

A copy of each comment letter with the substantive comments marked and individually identified is available for review in Attachment A of this appendix. Within Attachment A, each letter is identified by commenter type. For example, agency comments are identified by “AGY,”

organizations by "ORG," businesses by "BUS," and citizens by "CIT." Each commenter type is also assigned a unique number, so that the first agency listed would be "AGY-1." Each comment is also uniquely numbered. For example, the first comment from "AGY-1" would be "AGY-1-1."

Substantive comments are grouped in the following themed subsections. After a summary of the comment theme, the specific comments that were summarized are listed, then a response to each comment theme follows. All comment letters were reviewed and included in the administrative record.

3 Comments and Responses

3.1 Analysis of Construction-Related Impacts

3.1.1 Comment Summary

The EIS should disclose, and the ITP should cover, construction-related take, including the effect of the road network, and clarify who is responsible for monitoring, minimizing, and mitigating potential take from construction. Issues raised include the following:

- The potential for take related to collision with non-operational turbines is not zero, and the evidence cited is not convincing.
- The potential for take related to collision with gen-tie lines, support structures, meteorological towers, and roads should be included in the ITP.
- Cited levels of collision risk for non-operational turbines and operational turbines are similar.

3.1.2 Comments

- AGY-2-4
- ORG-3-5
- ORG-4-1
- ORG-4-2
- ORG-5-2
- ORG-5-4

3.1.3 Response

A number of comments requested additional discussion about construction effects on the covered species relative to analysis of take. The coverage of the ITP, and by extension the scope of the EIS, is based on administration of Section 10(a)(1)(B) of the ESA. On April 26, 2018, the Service's Principal Deputy Director provided a guidance memorandum on the trigger for an incidental take

permit under Section 10 (a)(1)(B) of the ESA where occupied habitat or potentially occupied habitat is being modified (Service 2018i). The guidance clarifies the following:

> The HCP process is applicant driven, and that includes the threshold determination of whether to develop an HCP and apply for a permit. That threshold determination ultimately rests with the project proponent. Project proponents can take Service input into account and proceed in a number of ways, based upon their own risk assessment. They may proceed (at their own risk) as planned without a permit, modify their project and proceed without a permit, or prepare and submit a permit application. The biological, legal, and economic risk assessment regarding whether to seek a permit belongs with the private party determining how to proceed. (USDI 2018).

In this matter, the applicant has determined that the risk of take associated with the construction of the Project is low. The applicant has therefore decided to proceed at its own risk by constructing WTGs, transmission lines, meteorological towers, and other Project features without an ITP.

Nonetheless, consistent with 40 CFR 1508.25(a)(1), the EIS does analyze the potential for impacts to the human environment, including the Covered Species, from construction as a connected action in Chapter 5. As noted in Section 5.1, on-site risks associated with construction (such as exposure to increased noise and activity or harm from collisions with vehicles or equipment) are not likely to affect Covered Species. However, there is a chance for collisions with non-operational WTGs and meteorological towers. Risk of collision with other facilities such as the transmission line are also possible, but less likely. As described in the Final EIS, the likelihood of take from standing WTGs prior to operation is partly a function of the duration of that project phase. Although the Service has no information suggesting a significant delay between those phases, the analysis presented enables consideration of effects across temporal scales.

3.2 Description of Operations and Maintenance Activities

3.2.1 Comment Summary

The EIS should clarify the O&M activities to be performed for each project component, including frequency and methods (e.g., right of way maintenance timing and methods, transmission line and road maintenance activities, and activities associated with maintaining WTGs).

3.2.2 Comment

- AGY-2-12

3.2.3 Response

Information in the EIS is based on that provided by the Applicant in the HCP. Section 2.3 of the Final EIS generally describes O&M activities that are applicable to Project components, including the relative frequency of these activities. Minor revisions have been made to the Final EIS to clarify that the ITP, as requested by the Applicant, would only cover WTG O&M and site management, which includes the activities listed in Section 2.3.2.1. The methods for this work include standard industry practices plus implementation of the HCP conservation measures that include conditions for vehicle operations, trash management, and prescriptions for maintaining cleared spaces (see Section 2.3.2.1 of the EIS for more detail). Standard industry practices may include, without limitation, minimizing the frequency and duration maintenance workers are on site while still ensuring proper Project performance, using the site only for its approved land-use purposes, preventing unnecessarily elevated fire risk, implementing all management and monitoring commitments as documented, and other similar measures. In addition, O&M activities in general are further described, where applicable, under each environmental resource in Sections 4.2 through 4.15 of the EIS.

3.3 Evaluation of Alternatives

3.3.1 Comment Summary

The Final EIS/HCP should evaluate other alternatives that were not specifically considered in the Draft EIS, such as the following:

- Combining Alternatives 2 and 3
- Moving/curtailing five turbines closest to the known nesting sites or other high-detection turbines
- Considering the use of other turbines to reduce effects to birds
- Expanding curtailment to include sunset, additional turbines, a longer season, or nighttime
- Extending curtailment periods from April 15 to August 15

3.3.2 Comments

Combine Alternatives 2 and 3:

- AGY-1-2
- AGY-1-11
- AGY-2-11
- CIT-4-1
- ORG-2-1
- ORG-3-1
- ORG-3-10

Moving/curtailing the five turbines closest to the known nesting sites or other high-detection turbines:

- ORG-3-7

Considering the use of other turbines to reduce effects to birds:

- CIT-9-1

Expanding curtailment to include sunset, additional turbines, nighttime, a longer season, or construction:

- ORG-2-4
- ORG-2-8
- ORG-2-11
- ORG-3-6
- ORG-3-8
- ORG-4-6

ORG-5-1Extending curtailment periods from April 15 to August 15:

- AGY-1-5

3.3.3 Response

The Service considered a reasonable range of alternatives, each of which were rigorously explored and objectively evaluated. Alternatives that inform the Service and the public about the range of potential effects were prioritized, including the measures that would minimize the effects of the taking beyond the maximum extent practicable. Alternatives outside the decision authority of the Service were deprioritized unless they could be used to avoid impacts to Covered Species; no practical measures for complete take avoidance were found within reasonable alternatives to the proposed action. Each alternative was selected to provide information specifically germane to the Service's evaluation of its Proposed Action, which is issuance, denial, or issuance with conditions of the ITP.

Alternatives 2 and 3 address a range of variations on curtailment (e.g., number of curtailed WTGs, time of day, and duration of curtailment). While some alternatives may represent additional variation, based on the analysis in the EIS, these variations are not likely to result in substantial decreases in take. For example, Alternative 3 includes curtailment at dusk, which addresses comments to consider curtailment during sunset and at night. It also includes curtailment from April 1 to September 30, which addresses comments to consider additional seasonal curtailment. Furthermore, consideration of full curtailment during all hours of the breeding season is expected to result in similar effects on murrelets as Alternative 3, because the

vast majority of exposure to turbines is during dawn or dusk flights. The best information used in Service modeling indicates that the number of daytime/nighttime flights is relatively low compared to the number of dawn or dusk flights.

A new analysis combining Alternatives 2 and 3 is not necessary because the result of that combination is disclosed in the EIS through the evaluation of the individual alternatives.

Some of the comments suggest alternatives that are not consistent with the Applicant's requested Covered Activities. For example, some comments request consideration of alternatives that address turbine and transmission line siting, construction, or equipment selection. Because these alternatives are outside the scope of the Applicant's ITP coverage request, they were not considered in detail by the Service.

3.4 Operational Risk of Collision

3.4.1 Comment Summary

The EIS should disclose and the ITP should cover the potential for take associated with other stationary features, such as the transmission line and meteorological towers. The Project will use self-supporting permanent meteorological towers, thereby minimizing avian collisions by avoiding the use of guy-lines to support the towers. This includes accounting for the potential for weather conditions such as fog or low clouds to affect murrelet flight heights and ensuring the HCP's monitoring and adaptive management programs address mortality related to overhead power lines.

3.4.2 Comments

- AGY-1-4
- AGY-2-4
- ORG-2-6
- ORG-5-3
- ORG-5-5

3.4.3 Response

As noted in the response to Comment Theme 3.1, it is the Applicant's choice to seek an ITP and define the activities that would be covered. Revisions have been made to the Final EIS to clarify that the ITP would cover operation of the WTGs and associated site management but that ITP coverage for Covered Species collision with other stationary features is not being requested and is not being provided. The Applicant has accepted the risks associated with this choice.

The proposed measures for road management and road construction, particularly the vehicle speed limits, make the potential for take of Covered Species from road system management

extremely low. Road construction would be permitted through Lewis County, which has confirmed that if road locations trigger other environmental reviews, such as water quality concerns, the relevant permitting procedures would be triggered. The commenter is also interested in the maintenance status of Project roads; because the HCP covers the operational period of a limited-lifespan facility, it is possible that roads used in implementing the permit will no longer be needed after decommissioning the Project. However, that information is not currently available. Roads used for Project operations are expected to be in use.

3.4.3.1 Marbled Murrelets

The potential for marbled murrelets to collide with other stationary features, such as the transmission line and meteorological towers, was addressed in the EIS. Risks during construction were addressed in Section 5.3.6, and risks from standing features other than the WTGs were addressed in Section 4.7 under the No Action Alternative Option A. In both cases, the risks were determined to be low for the reasons noted. This is because the marbled murrelets would usually travel through the Project Area at a height greater than the line, which is expected to be no more than 35.05 meters (115 feet), and because there is limited suitable habitat or flight corridors near the line. To further clarify that these risks would also exist under the Proposed Action, Section 4.7 of the Final EIS has been revised to include this information under Alternatives 1, 2, and 3. Commenters recommended adjusting models to address collision risk for murrelets in foggy or low-cloud conditions but did not provide additional information. The Service considered the comment and identified no specific information about the collision risks for murrelets in foggy or low-cloud conditions to better inform the quantitative modeling.

3.4.3.2 Bald and Golden Eagles

With respect to bald and golden eagles, there is not a method to quantify the risks of collision with transmission lines or the meteorological towers. However, these risks were qualitatively discussed in Section 4.7 of the EIS, under the No Action Alternative. To further clarify that these risks would also exist during Project construction and as the result of the Proposed Action, Sections 4.7 and 5.3.6 of the Final EIS have been revised to include this information.

Both bald and golden eagles have been shown to collide with stationary structures on occasion, but considering the length and number of structures, the Service believes the risk is insignificant. In addition, the take modeling associated with WTG operation was intentionally conservative and is likely to have overpredicted take. Take from stationary structures, if any occurs, is not covered and is not likely to exceed the anticipated biological effects due to the conservative nature of the Service's analysis. Therefore, take from impacts of Covered Species with these

structures is not covered but is unlikely to exceed the authorized take limits for the following described reasons:

- The model assumed that all WTGs would spin during all daylight hours every day of operation (except for those daylight hours identified for curtailment). This is conservative because WTGs are unlikely to be in motion during all of those hours every day of the year.
- The 80th quantile of the probability distribution from the Service's Bayesian collision risk model was used to predict take. As such, the Service expects there to be an 80% chance that actual take at the project is equal to or less than authorized take.

3.5 Operational Impacts from Roads

3.5.1 Comment Summary

The EIS should disclose and evaluate the operational impacts of the road system, such as public accessibility, erosion management, and the temporary or permanent status of the road system. Figures within the EIS should be updated to illustrate the proposed power line corridor and underground collection system.

3.5.2 Comments

- AGY-2-1
- AGY-2-4

3.5.3 Response

Proposed site management activities, including road and transmission line maintenance, are addressed in Section 2.3.1 of the EIS. The Project substation will normally be accessed monthly for basic visual inspection and sampling, with maintenance occurring annually. The transmission line will be inspected annually. Site roads are maintained using normal gravel road maintenance equipment once or twice per year for the life of the facility. Regular site inspections for erosion and other environmental reasons typically occur weekly. Access roads as they relate to supporting Project construction are discussed in Section 5.1.1.5, and existing roads are shown in Figure 2.1-1. As design progresses and to the extent there is a potential for impacts related to the road system or other elements of the Project, the Applicant will obtain the necessary permits or approvals, as noted in Chapter 5.

Transportation-related impacts are addressed in Section 4.12 from Project operations and Section 5.3.11 from Project construction. While access to the Project Area would occur by public roadways such as Washington Interstate 5 and State Road 507, most traffic associated with the Proposed Action would occur by existing roads on private property. Erosion management is discussed in the EIS under Sections 4.2, 4.4, and 5.3. Actions to address erosion impacts on the

road system include best management practices relevant to soil disturbance and slope stability as well as the preparation of a Temporary Erosion and Sediment Control Plan during construction.

3.6 Operational Impacts on Vegetation

3.6.1 Comment Summary

The EIS should disclose and evaluate the effects on vegetation as a result of the O&M of linear corridors such as roads, electrical towers, and the WTG line. This should include consideration of the following:

- A vegetation management plan for invasive species within the power line right-of-way and along roads
- Effects to stream shading from vegetation removal and management

3.6.2 Comments

- AGY-2-3
- AGY-2-5
- AGY-2-7

3.6.3 Response

Minimal to no vegetation removal is proposed during Project O&M. The potential impacts from Project O&M on vegetation are addressed in Section 4.5 of the EIS. This includes the potential for spread of invasive species, which was determined to be low. As further noted in Section 4.5, it is assumed that O&M activities would require that vegetation be maintained (i.e., mowed) adjacent to roadways, under power lines, in carcass search areas, and under the WTGs. These areas would have been previously disturbed, so this results in these areas being maintained as disturbed grassland habitat throughout the duration of the Project.

3.7 Operational Impacts on Wildlife

3.7.1 Comment Summary

The EIS should disclose and evaluate the effects on vegetation and wildlife as a result of the O&M of roads, electrical towers, and WTG line, including the following:

- Changes to behavior or predators (e.g., nest predation by corvids) where edge habitat is created along the right-of-way
- Fire risk data and analysis, including project-related ignition sources

3.7.2 Comments

- AGY-2-2
- AGY-2-9

3.7.3 Response

As noted in the response to Comment Theme 3.6, there is minimal potential for impacts on vegetation related to the Proposed Action. Changes to vegetation and related impacts on wildlife from construction, including the conversion of potential habitat, are generally addressed in Chapter 5 of the EIS. As noted in Section 5.3.5, the determination to allow conversion of upland areas to Project uses is under the jurisdiction of Lewis and Thurston counties and would be required to be implemented consistent with local land use standards and other applicable laws. Impacts affecting sensitive areas, particularly those that provide habitat to special-status wildlife species, may require further review and oversight by other resource agencies prior to construction.

The potential for increased risk of fire from the Proposed Action is addressed in Section 4.14 of the EIS. As noted in the EIS, operation of the WTGs could slightly increase the potential risk of fire due to short-circuiting of electrical components or the increased risk of a lightning strike to the rotating turbine. There is also potential for fire along the transmission line because of the electrical nature of the system. Project O&M is not expected to exceed the capacity of existing fire services or law enforcement; therefore, the Service anticipates minor effects of fire on vegetation related to the Project that are consistent with the types of temporary vegetation impacts that already result from stochastic fire events in the Project Area.

3.8 Operational Impacts on Water Quality

3.8.1 Comment Summary

The EIS should disclose total maximum daily loads where applicable, how the Proposed Action would prevent deterioration of water quality, and the specific discharges and pollutants likely to affect those waters.

3.8.2 Comment

- AGY-2-8

3.8.3 Response

The potential impacts on water quality from the Proposed Action were addressed in Section 4.4 of the Final EIS. As noted in that section, the potential for water quality impacts from Project O&M are low. The potential for water quality impacts from construction were addressed as a connected action in Chapter 5. As noted in Section 5.3.3, the precise location of Project elements (e.g., access roads, transmission line) are not yet determined, and it is not known whether potential impacts to any waters would occur. If it is determined that subsequent permits, including those noted in Section 5.3.3, are required, a review of water quality impacts would be pursued at that time. Any permit issued by the Washington State Department of Ecology, the U.S. Army Corps of Engineers, or the U.S. Environmental Protection Agency would meet the

standards for the applicable issuance criteria. The Applicant has assured the Service of the intent to manage the project otherwise legally with regard to all local, state, and federal laws.

3.9 Estimating Murrelet Take

3.9.1 Comment Summary

The following information should have been considered in the analysis of marbled murrelet take, and the proposed mitigation should be adjusted as needed:

- Collision avoidance rates are not based on best available science. Additional studies/assumptions are suggested.
- Nest success rate assumptions are too high, and an alternative assumption should be used.
- A more conservative reproductive rate should be used.
- The breeding season used is not consistent with Service guidance.
- Radar surveys are problematic because they were not done for the full breeding season of April 1 to September 23 (Service 2012a) versus May 11 and August 4 and they did not include the full Project Area (e.g., the northwest section of WTG line and the gen-tie line).
- Take estimation does not include fire risk data or analysis.
- Take estimation is confusing.

3.9.2 Comments

- AGY-1-3
- AGY-2-9
- ORG-1-1
- ORG-1-2
- ORG-2-5
- ORG-2-7
- ORG-2-9
- ORG-2-10
- ORG-2-12
- ORG-2-13
- ORG-3-9
- ORG-4-10
- ORG-5-6

3.9.3 Response

The terms of the ITP will specify the level of allowed take and the terms of the mitigation required to meet the issuance criteria. Section 4.7 of the Final EIS has been revised to clarify the anticipated take and requested amount of take. As noted in the Final HCP and Final EIS, should

the ITP be issued, the Applicant would be required to implement Service-approved compliance and adaptive management programs. The intent of these programs is to ensure that the Applicant meets the terms of the ITP while allowing flexibility to rely upon better information if it becomes available, not limited to improved methods of compliance monitoring or the need to adapt the implementation of agreed-upon conservation measures. For example, net removal may occur throughout the Salish Sea, in marbled murrelet Conservation Zones 1 and 2.

The Service used the best available information to support environmental analyses, including estimation of impacts on the Covered Species, and has based the analysis in the Final EIS on the best available science. To this end, the Service has reviewed the assumptions that were used in the Final EIS analysis and determined that that alternate assumptions do not change the rigor or accuracy of the analysis. The radar detection methods considered in the analysis contribute to the best available data. While each detection method for the marbled murrelet is likely to incorporate error due to the fast-flying, small-bodied bird attributes of the species, the conservation measures and effects analysis each reflect a series of conservative assumptions to ensure that any such detection errors do not result in a systematic misrepresentation of the best available exposure modeling. With regard to the breeding season for marbled murrelets, the Service acknowledges that the marbled murrelet nesting season extends beyond those dates used by the Applicant to develop their conservation measures. To account for this variation, the Service evaluated Alternatives 2 and 3, which consider alternate curtailment regimes, including implementation of curtailment during the entire nesting season.

A commenter identified additional information specific to offshore wind energy infrastructure for the Service to consider (see comment ORG-3-9). However, the Service used the best available information applicable to the terrestrial wind energy project under review.

3.10 Murrelet Population Effects – General Approach

3.10.1 Comment Summary

The analysis should consider species status and effects of the Proposed Action on metapopulations in the disclosure of potential cumulative effects. As a result of the potential cumulative risks to the species, collision risks associated with the Proposed Action are not conducive to species recovery and would exacerbate the decline of the species.

3.10.2 Comments

- AGY-1-1
- ORG-2-16
- ORG-4-7

3.10.3 Response

Cumulative effects are addressed in Chapter 6 of the Final EIS and include consideration of anthropogenic effects and effects on metapopulations. As noted in Section 6.2.2, commenters are correct that the analysis shows populations reach quasi-extirpation rates more quickly with the Proposed Action when no mitigation is implemented; however, models of the effects of mitigation show that, under an optimistic scenario, the beneficial effects will fully offset the effects of the permitted take during the 30-year permit term. Although there is uncertainty as to the likely reproductive output of the conservation lands over the 30-year permit term, given that the habitat will be protected in perpetuity, even under a more pessimistic scenario, the beneficial effects of the mitigation actions will fully offset population effects, with additional benefits to murrelet nesting habitat distribution in perpetuity.

3.11 Murrelet Population Effects – Revised Assumptions

3.11.1 Comment Summary

The PVA analysis should be revised to account for the following:

- The scale of the PVA being too coarse—it should rely on data obtained in coordination with the Washington Department of Fish and Wildlife, the Service, and DNR to better account for impacts on the local subpopulation
- The best available science, including an appropriate murrelet productivity rate and estimated age of first breeding
- Murrelet sex bias
- The possibility that murrelets in the seven occupied sites commute westward to the Pacific Ocean, including a nest-to-sea "Least Cost Path" analysis

3.11.2 Comments

- ORG-2-2
- ORG-2-10
- ORG-2-14
- ORG-4-3
- ORG-4-4
- ORG-4-5
- ORG-4-8
- ORG-4-9
- ORG-5-7

3.11.3 Response

Suggested refinements to the PVA are not expected to result in substantial changes to the modeled outcomes presented in Section 6.2.2 of the Final EIS. For example, considering the question of sex bias, it is not expected that a PVA evaluating the worst-case scenario of only affecting males would represent a measurable change to the parameters already considered. In addition, there are also uncertainties about the gender ratio of individuals on the landscape: some samples showed a male-bias population, others show the opposite, and others are balanced (Vanderkist et al. 1999; McFarlane-Tranquilla et al. 2003; Hébert and Golightly 2006). Nonetheless, based on the difference in the number of males versus females, approximately three to four more males than females would be expected to be killed per decade. This is not likely to shift the overall sex ratio in the population at large. For these reasons, the minor adjustments to the PVA that could be made to reflect different assumptions about the gender ratio of affected individuals is not expected to improve the accuracy of the Service's analysis. The Service considered factoring a nest-to-sea least-cost path and concluded that this would not improve the analysis because the PVA already addresses the possibility that the murrelets could be taken from the populations in Conservation Zones 1 or 2 and because no assumptions are made regarding the exact flight path of murrelets traveling through the Project Area.

Additionally, the use of a 2-year-old breeding age is a conservative assumption because the Applicant is mitigating for effects on adult equivalents. Therefore, selecting the youngest likely age for adulthood maximizes the beneficial effect of the HCP's mitigation measures. While the Service generally agrees that the best available information indicates some variability in the breeding age of marbled murrelets, revisions to the analysis are not appropriate because the assumption selected was conservative.

With respect to the grouping of murrelets nesting near the Project Area, it is unlikely that these murrelets constitute a true subpopulation. In terms of population genetics, murrelets form one large population from Northern California through most of Alaska, with small distinct populations in central California and the Aleutian Islands (Friesen et al. 2005; Hall et al. 2009). This indicates that dispersal and genetic mixing happens at scales larger than a local area of nesting habitat. Therefore, it may not be appropriate to apply a PVA analysis to the local grouping. Instead, any effects at the local scale are likely to be related to murrelet behavior and choice of nesting locations.

3.12 Management of Proposed Conservation Lands

3.12.1 Comment Summary

The EIS should consider the following information related to the evaluation of the impacts of the proposed conservation lands:

- The conservation lands may not provide sufficient murrelet habitat, and therefore additional locations should be considered.
- Tree age is too young in the proposed parcels.
- The assumed density of murrelet nesting is too high for the proposed area of mitigation lands; additional lands are necessary to achieve mitigation numbers.
- The proposal does not address the potential need for the Applicant to compensate for the loss of habitat that may occur from natural disasters.
- The management proposal should minimize impacts on existing murrelet habitat.

3.12.2 Comments

- AGY-1-7
- ORG-3-3
- ORG-4-12
- ORG-4-13
- ORG-4-14

3.12.3 Response

The compliance process for Section 10(a)(1)(B) of the ESA requires an HCP be developed to describe the possible effects of a proposed project and document how the Applicant will minimize and mitigate the potential for impacts to any Covered Species. This process is driven by the Applicant, who in the case of the Proposed Action has requested coverage for incidental take from WTG O&M and site management.

In consideration of the potential for take and the need for mitigation, the Service has reviewed the HCP and will document findings in the Biological Opinion, which will likely include certain conditions that the Applicant must implement in order to ensure compliance with both Section 10(a)(2)(A) of the ESA and the BGEPA implementing regulations found in 50 CFR 22.26.

With respect to the potential for loss of habitat from natural disasters, adaptive management may identify actions to respond to natural disturbance at finer scales within the conservation lands. For example, in some cases of unavoidable habitat losses on the conservation lands, it may be appropriate for the Applicant to log the affected lands and purchase additional conservation areas.

The management proposal for the conservation lands is expected to avoid adverse effects on murrelets to remain consistent with the proposed permit because adverse effects of conservation

site management are not proposed for coverage. Conservation site management is intended to benefit the structure and extent of habitat over time, as described in the Final EIS. This means any silvicultural activities would be designed to enhance stand conditions in the portions of conservation lands with less-mature forest through work conducted outside of the marbled murrelet nesting season or without generating significant noise or visual disturbance. The existing analysis accurately considered that some portions of the conservation site contain younger forest that is not currently providing platforms for murrelet nesting.

Raphael et al. 2018 describes the available information on nest success in a wide variety of conditions and concludes that at broad scales, there remains uncertainty in nest success rates of the species. The Service did consider this information and concluded the nest success information represented in McShane 2004 was applicable to the analysis of this project considering the nest success rates and supporting information by conservation zone. The Service also considered that the nest success is likely higher nearer to marine foraging areas than at the inland margin of the species' range and that the use of similar nest success values for estimating impacts and mitigation is a conservative factor for this reason.

The analysis presented in the Final EIS demonstrates that the conservation lands, in conjunction with derelict fishing net removal, provide sufficient mitigation to offset the potential take of the Covered Species that may occur as a result of the Proposed Action. As described in the Final EIS, the conservation parcels contain forest stands of various ages, including approximately 340 acres of stands that are 60 years old or older. These mature stands contain patches of remnant old trees that contain suitable platforms for marbled murrelet nesting. The average density of marbled murrelets in nesting habitat is relatively low at broad landscape scales. Research on the Olympic Peninsula estimated an average density of 370 acres of nesting habitat per marbled murrelet (Raphael et al. 2002). However, at the scale of individual patches of nesting habitat, marbled murrelets have been documented nesting within 300 feet of each other (Nelson 1997). As noted in Section 6.2.2.4 of this EIS, although there is uncertainty as to the likely reproductive output of the conservation lands over the 30-year permit term, given that the habitat will be protected in perpetuity, even under a more pessimistic scenario, the beneficial effects of the mitigation actions will fully offset population effects over a longer period of time, with additional benefits to murrelet nesting habitat distribution.

3.13 Proposed Derelict Net Removal

3.13.1 Comment Summary

The EIS should consider the following information in evaluating the potential impacts of the proposed derelict net removal program:

- The location of derelict net removal does not account for the Pacific Ocean group of murrelets.

- There should also be a monitoring and adaptive management program over this element of the mitigation.

3.13.2 Comments

- AGY-1-8
- AGY-1-9
- ORG-2-13
- ORG-3-4
- ORG-4-11

3.13.3 Response

The *Recovery Plan for the Marbled Murrelet (Washington, Oregon, and California Populations)* (Service 1997) identifies murrelet mortality in fishing nets as a threat affecting marbled murrelets in the Salish Sea, resulting in mortality of individuals. The Service's 2009 *Marbled Murrelet (*Brachyramphus marmoratus*) 5-Year Review* also found that murrelet mortality is documented in gillnets in Washington waters (Service 2018g). Therefore, the Service does consider net removal a meaningful way to avoid otherwise anticipated mortality. Marbled murrelets that forage in Zone 2 also forage in Zone 1 during the breeding season (Lorenz et al. 2017) and during the winter and therefore would benefit from derelict net removal in Zone 1. As a result, the Service expects the derelict net removal program will provide benefits to a relevant murrelet population.

For additional information related to the process of ensuring compliance with the ESA and BGEPA, see the response to Comment Theme 3.12.

3.14 Adequacy of Mitigation for Bald and Golden Eagles

3.14.1 Comment Summary

The EIS is not clear that the proposed HCP will be sufficient to offset take. With respect to the proposed eagle power pole retrofit program, the compensatory mitigation should be revised to be consistent with the current management of mitigating golden eagle electrocutions (Columbia Plateau model).

3.14.2 Comment

- AGY-1-10

3.14.3 Response

Section 4.7 of the Final EIS includes an analysis of the potential for take of bald and golden eagles and evaluates the effects of the Applicant's proposed eagle power pole retrofit program. In addition, Section 6.2.3.1 of the Final EIS describes the Service's *Programmatic EIS for the*

Eagle Rule Revision (Service 2016b), which embodies the most recent regulations for eagle nonpurposeful take permits and eagle nest take permits.

While some details of the compensatory mitigation plan remain to be identified, retrofitting power poles could be accomplished by the following two types of mitigation programs: 1) a permittee-responsible mitigation approach where the applicant works directly with a utility in coordination with the Service to retrofit power poles; and 2) an in-lieu fee program, which is a type of mitigation banking approach where funding is directed at the discretion of the service provider in coordination with the Service. The Applicant is proposing the first approach (permittee-driven mitigation) be used in this regard. Considering the anticipated permittee-responsible approach, the number of retrofitted poles needed would be 145 poles if 30-year retrofits are installed and 332 poles if 10-year retrofits are installed. If the in-lieu fee approach is utilized, the number of poles needed to retrofit would be 342 poles assuming a 10-year retrofit. For more details on the options for implementing the power pole retrofit mitigation plan—including information on risk assessment, power pole prioritization, and monitoring strategy—refer to Section 6.2.3 of the HCP.

Because the HCP commits to retrofitting relevant power poles commensurate with the taking and within the appropriate EMU, uncertainty about the exact location of retrofits is a detail that will be determined through surveys of existing infrastructure. Retrofitting priority (i.e., high-risk) power poles will benefit eagles. The Service has determined that the proposed compensatory mitigation is adequate to offset predicted take of golden eagles at the required ratio of 1.2 to 1 because the retrofit priorities will be reviewed and approved by the Service.

The Service confirms that the Columbia Plateau model described by the Washington State Department of Fish and Wildlife was sent to the applicant on August 22, 2018. If the available in-lieu fee program is not used, the Service will be strongly encouraging that they use this model or equivalent if the poles they select to retrofit are outside the Columbia Plateau.

3.15 Adequacy of Monitoring and Adaptive Management

3.15.1 Comment Summary

The EIS and HCP are not clear as to whether the proposed monitoring intensity and adaptive management thresholds would sufficiently inform managers about permit implementation status. For example, bird strike detection modelling and carcass recovery methods carry the risk of not detecting all affected individuals, and additional measures should be considered, including the following:

- Increased radius for carcass searches
- Adopting technology to detect blade strikes
- Using specially trained canines to detect carcasses
- Additional information on a vegetation removal plan

- Collecting and publishing data
- Additional wildlife detection systems

3.15.2 Comments

- AGY-1-6
- ORG-2-15
- ORG-3-2
- ORG-4-15
- ORG-4-16
- ORG-4-17
- ORG-4-18

3.15.3 Response

The Applicant added detail to Table 33 of the Final HCP addressing these concerns related to monitoring methods, including addressing detection efficiency. Importantly, the Final HCP reflects the Service's recommended detection probability for interpreting mortality results. Additionally, because the HCP is the Applicant's proposal, the technology incorporated into the Project design, the area to be cleared for carcass detection, and the publication of proprietary data is within the discretion of the Applicant. The Service will share with the public the results of HCP implementation as described through HCP reporting and information the Service obtains over time. The Service will make HCP annual reports available to the public, along with any additional information that the Service may obtain. Commenters expressed concern about using the adaptive management monitoring methods and the response thresholds for determinations of permit compliance. The Service is confirming here that those methods and thresholds are used in the context of the Applicant's implementation of the adaptive management program and do not prevent the Service or the public from using other methods to evaluate permit compliance.

For additional information about the compliance and adaptive management programs in general, see the response to Comment Theme 3.9.

3.16 General Approach to the Analysis of Impacts on Wildlife

3.16.1 Comment Summary

The EIS analysis of wildlife impacts should consider additional survey information and include for public review and comment a Bird and Bat Conservation Strategy based on best available science and approved by the Washington State Department of Fish and Wildlife and the Service.

3.16.2 Comments

- AGY-2-10
- ORG-2-3
- ORG-2-5
- ORG-4-19
- ORG-4-20

3.16.3 Response

As noted in Section 2.1 of the HCP, the Applicant is committing to developing and implementing a Bird and Bat Conservation Strategy in coordination with the Service prior to beginning Project operations. The Bird and Bat Conservation Strategy is a voluntary effort the Applicant committed to separate from their requested permit. As noted in the HCP, there is no comprehensive program under the Migratory Bird Treaty Act to permit take that is incidental to otherwise lawful activities.

Commenters recommended the collection of new information with regard to avian surveys in portions of the Project Area to support this analysis. While the Service would also value additional information, the Final EIS analysis reflects the best available information.

3.17 Related Permits and Approvals

3.17.1 Comment Summary

Provide additional information about required permitting and disclose how permitting requirements have been reflected in the EIS.

3.17.2 Comment

- AGY-2-6

3.17.3 Response

Connected actions—those activities that are not directly authorized by the ITP—are evaluated in Chapter 5 of the Final EIS. Chapter 5 describes the permitting or approval processes that are anticipated to apply to each connected action. For example, Chapter 5 explains that Project siting, construction, and decommissioning would require (among other permits and approvals) a substantial shoreline development permit from Lewis County and a special use permit from Thurston County.

Other local, state, and federal agencies are responsible for enforcing compliance with applicable regulations to ensure the Applicant meets required conditions prior to constructing and operating the Project. Required permits or approvals from those agencies are addressed where applicable in

the discussion of impacts by resource in Chapter 5, including updates that have been incorporated since the issuance of the Draft EIS.

3.18 EIS Process

3.18.1 Comment Summary

An extension to the comment period was requested due to limited access to resources during the government shutdown.

3.18.2 Comment

- ORG-3-11

3.18.3 Response

The public comment period was open for 23 days prior to the government shutdown and remained open for the full 45-day period while the documents were available online for public review. All comments submitted through February 25, 2019, were considered.

Attachment A
Public Comment Letters

- AGY-1: Washington State Department of Fish and Wildlife
- AGY-2: U.S. Environmental Protection Agency
- BUS-1: Renewable Energy Systems, Ltd. (RES)
- CIT-1: Thomas Weissenberger
- CIT-2: Ronald Slater
- CIT-3: Anonymous
- CIT-4: Micah Stanovsky
- CIT-5: Zach Kieft
- CIT-6: Katherine Walton
- CIT-7: Jean Publieee
- CIT-8: David Shluker
- CIT-9: Kurtis Engle
- ORG-1: Willapa Hills Audubon
- ORG-2: Black Hills Audubon
- ORG-3: American Bird Conservancy
- ORG-4: Washington Forest Law Center
- ORG-5: Cascade Forest Conservancy

AGY-1

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Subject: Skookumchuck Wind Energy Project, LLC proposed Habitat Conservation Plan and Application for Incidental Take Permit for Marbled Murrelets, Bald and Golden Eagles

Dear Mr. Romanski,

Thank you for the opportunity to review and comment on the Habitat Conservation Plan (HCP) and the Draft Environmental Impact Statement (DEIS) for the Skookumchuck Wind Energy Project, LLC (SWEP).

The SWEP proposes to construct 38 wind turbines (137 MW) on ridge lines flanked by lower elevation stream-lined valleys in Lewis County and the O & M building in Thurston County; co-located with the Vail tree farm operations facility. The maximum wind turbine height of 492 feet (from ground to vertical blade tip); a maximum rotor diameter of 446 feet; approximately 36.5 miles of existing roads that will be upgraded; approximately 3.9 miles of new road that will be constructed; 17 miles of buried medium-voltage collection cable that will transport power to a substation along the ridgeline; and 15 miles of above ground transmission line that will transport power to the Puget Sound Energy Tano substation near the Centralia coal plant.

The Washington Department of Fish and Wildlife (WDFW) serves as Washington's principal agency on species protection and conservation (RCW Title 77). Legislative Mandate RCW 77.04.012 establishes the wildlife, fish, and shellfish are property of the state and that WDFW is entrusted by and through the Fish and Wildlife Commission to "preserve, protect, perpetuate, and manage the wildlife and food fish, game fish, and shellfish" and "attempt to maximize the public recreational game fishing and hunting opportunities of all citizens…"

AGY-1-1 Of greatest concern to WDFW from this project is the potential adverse impacts to Marbled Murrelets by the DEIS *Proposed Alternative* (i.e., HCP application), estimated by the Applicant to be an incidental take of 75 murrelets over the 30-year (about 2.5 per year) operation permit of the project. The Marbled Murrelet in Washington has a documented population rate of decline at 4 to 5% per year since 2001, and the Washington population has declined 44% in the period from 2001–2015 (Desimone 2016, Pearson et al. 2017), prompting the Washington Fish and Wildlife Commission the up-list the murrelet to State endangered in 2017. As reproductive potential is low for this species, we believe further added anthropogenic threats such as collision risk from wind turbines and related

AGY-1-1 (con't)
AGY-1-2

infrastructure are not conducive for murrelet persistence and recovery efforts. Given this potential adverse impacts to murrelets, WDFW would ultimately prefer a combination of DEIS *Alternative 2*, Modified Project Site Design, which would not operate the five eastern-most turbines (closest to potential nesting habitat block where a concentrated rate of detections occurred during radar surveys for murrelets) and *Alternative 3* where turbines T1 through T28 operate under an expanded set of curtailment measures, which we propose should be implemented during both the dawn daily peak activity period and the dusk daily peak period (i.e., 2 hours before to 1 hour after sunset). Our combination alternative would include measures as outlined in our comments (below) on the proposed HCP for improvements for the analysis, minimization/mitigation, and monitoring plans.

WDFW supports the effort to properly locate and operate wind power projects consistent with WDFW's Wind Power Guidelines, in support of zero-emission electricity generation. Over the past 4.5 years, WDFW has worked with the developer, Skookumchuck Wind Energy Project, LLC (RES America, Applicant) and the U.S. Fish and Wildlife Service (USFWS) to review plans and data and address potential impacts and mitigation related to Marbeled Murrlets and Bald and Golden Eagles. We have also reviewed and commented to RES America and their consultants on various other aspects of the proposed project related to avian and bat resources. Most recently (Nov. 2018) we reviewed the SEPA documents and provided commnets to Lewis County, the local permitting authority. Below we provide comments on the Applicant's proposed HCP.

Comments on the Habitat Conservation Plan (Proposed Alternative)

The Habitat Conservation Plan (DEIS *Proposed Alternative)* describes the potential impacts to Marbled Murrelets and Bald and Golden Eagles associated with the SWEP and also serves as an application to the U.S. Fish and Wildlife Service for an incidental take permit for Marbled Murrelets and Bald and Golden Eagles. Below we provide a summary of our most important concerns.

<u>Marbled Murrelets</u>

HCP Section 1.6.1.1 Alternatives Considered (page 4), is somewhat confusing when trying to compare with the DEIS stated alternatives of No action, Alternative 1 (proposed HCP application), Alternative 2 and Alternative 3, because this HCP section does not describe label them as such and some of the descriptions are different or missing the exact language of the alternatives.

AGY-1-3

Requested murrelet take. Please provide clarification on the requested take amount for murrelets. The statement on requested take of individuals (HCP 5.1.2.4, page 40) is for an incidental take permit for 75 birds. Indirect impacts to Marbled Murrelet individuals (e.g., loss of breeding females and progeny from incidental take), which was estimated as "10 adult equivalents" (i.e., defined as 2-yr-olds: HCP page 62). This seems to mean the actual take request should be for 85 murrelet individuals and not the stated 75 murrelets. If so, the impacts to murrelets would not be fully offset by the proposed mitigation.
In HCP Section 5.1.2.5 Indirect Effects, the Applicant calculates an annual loss of 0.334 two-yr-old murrelets, and this section concludes with the statement that 2-yr-old "adult equivalent" murrelets have "low reproductive value…the loss of fledglings is negligible… in terms of impact of the take." This statement makes no sense, because this is a loss of 10 equivalent adults over the 30-year permit application, which is not very clear how they are factored into the mitigation calculations. Please clarify this situation for us.

Construction phase analysis and monitoring (pre-operations) is non-existent. As we commented in our NEPA scoping comments (June 4, 2018 letter to USFWS), it was unclear to us when Lewis county EIS

coverage of project construction ends and when the NEPA HCP coverage begins with an "operating permit". This is due to the time period it takes to construct all of the turbines and other supporting infrastructure. We understand from the Applicant that some inoperable structures and supporting infrastructure will be erected and standing for a time period before operations and maintenance phase begins, but they are not seeking coverage in this permit application (HCP section 2.3, p12). These erected structures all pose a collision threat to all birds and bats, and are the responsibility of the

AGY-1-4 Applicant. It is imperative that an estimate of collisions or mortality impacts need to be provided in the HCP application during this phase in order to calculate total perceived impacts from the project. Without this information, we have to assume that the project is not fully mitigated, because this take has not yet been assessed, nor is there a plan for monitoring potential impacts. Analysis and estimates of potential and perceived impacts to Marbled Murrelets, Bald and Golden eagles, and other Birds (under Migratory Bird Treaty Act) and Bats from the construction of powerline towers, stringing of powerlines, turbines and blades that are erected and in place for a duration of time *before* those actual structures become operable need to be addressed before an incidental take permit is issued. As an example, there is potential for collision risk with the erection of suspended new power lines (tower structures across 15 miles) enroute to the substation, as well as partially or fully constructed (but not yet operational) wind turbines as risks not fully analyzed for murrelets, eagles, bats or migratory birds. These concerns presents risk that is not mitigated for in this HCP, as there is no analysis of take or monitoring planned for the overhead power lines running to the substation.

AGY-1-5 *Minimization measures.* Regarding HCP Section 6.1.2.2 (page 62): WDFW supports curtailment of <u>all</u> turbines at peak morning flight times during the murrelet breeding season, beginning in April, as stated above. There is additional risk to breeding murrelets making extra nest-provisioning visits to young, which may be 1-8 times per day. This is extra collision risk that not explicitly minimized for by curtailment and may be outside the daily peak activity dawn and sunset periods. Extra nest-provisioning visits by breeding murrelet adults could begin as early as May, which was indicated by breeding in April (Lorenz et al. 2017). Therefore, as a minimization measure, it would be prudent to extend the curtailment periods from April 15 to August 15, which also corresponds to the official breeding period for Washington as defined by the Pacific Seabird Group.

WDFW was not originally in support of turbine development at murrelet Radar Survey Stations 9 and 10 (turbines T29 - T38), which are nearest occupied habitat. While Survey Stations 5 (T1-T5) and Station 10 (T34 -T38) had the highest numeric murrelet passage rate during pre-construction baseline studies, we demonstrated in our comment letter of an earlier HCP draft that statistically, the same or similar risk occurs across Survey Stations 9 and 10 (T29 -T38, the eastern-most 10 turbines) (E. Keren, WDFW Biometrician, pers. comm.). Murrelet flight patterns may change in response to the operating turbines, sea conditions and food availability, or for other reasons outside of this wind project. For this reason, and as part of an adaptive management strategy, WDFW recommends that turbine curtailment should not be limited to T1-T5 and T34-T38. We suggest additional curtailment scenarios of stations that likely have the same or similar risk (i.e., T29-38) be curtailed. These are the closest turbines to the large block of contiguous nesting habitat. When data (fatalities, both incidental and scheduled) indicates, other at risk turbines should also be included in curtailment scenarios.

AGY-1-6 In general, WDFW supports the concepts of Compliance Monitoring and Tiered-approach for adaptive management for murrelets and eagles to address fatality monitoring estimates and incidental fatalities. However, the preliminary detection probability estimates for murrelets are low (likely ≤0.27) which is concerning. Because there is a large amount of uncertainty in bird strike detection modelling and carcass recovery, there needs to be a reliable estimate of how the detection probability translates into

AGY-1-6 (cont'd) mortality numbers for every murrelet found during a search. This will also directly affect the adaptive management triggers. Also, if no murrelets are detected during ground searches in a given year, what is the actual probability of mortality event for that year?

A ground search radius of 70 meters (140x 140m grid, small bird search) for a rotor blade sweep of 136 meters seems unreasonable because this assumes carcasses that hit within the rotor swept area will fall straight down, and does not account for possibility of spinning blades casting carcasses farther afield. We propose that at minimum, a 100 m or greater search radius be used for small bird grid.

We have concerns for the actual minimum searchable area covered by grid carcass searches due to vegetation height and complexity. Detectability will be very minimal outside of the construction pad where the vegetation is not managed. By visual estimate, about 12 of the 38 turbine 140x140 m grids will have at least 50% of the area unsearchable due to uncleared vegetation height or slope. Once vegetation such as salal, for example, reaches 1-2 feet, carcass detectability will be *extremely low*. We ask that the final HCP should address part of this detection uncertainty problem by incorporating other ways to greatly improve detectability estimates by 1) using specially trained canines for carcass detection and 2) adopting technology to detect blade strikes; e.g., Flowers (2015:77) cited a 0.57 chance of detection using turbine blade vibration sensors and cameras. This is positive data that could be modeled to improve and/or to supplement the ground search detection data. Other monitoring alternatives, such as the use of radar surveys, could be implemented if the detection rate cannot be increased.

AGY-1-7 *Mitigation.* We appreciate the comprehensive effort undertaken to select and justify the conservation parcels as part of the long-term strategy for murrelet mitigation. In Section 6.1.3.3 (page 72), part of the mitigation strategy for murrelets assesses 2 parcels of forested land would likely support 2-4 murrelet nests, each producing 0.55 fledglings per year (1.1 if alternative breeding years) and further assumes .476 success rate to survive to breeding age 2, so that 0.52 to 1.0 total 2-year old ("adult equivalent") murrelets are produced each year from 2 to 4 nests. However, inherent in this rate is a seemingly high nest success rate assumption. Also, there is no further calculation of survival to a more likely average breeding age of 6 years for murrelets, which would further reduce the estimate of 15- 30 individuals produced. Therefore, there should be a range of estimates around the numbers of 15 to 30 marbled adults expected to be produced. Nest success rates on the Olympic Peninsula were 0.20 and Desolation Sound, BC were 0.38 - 0.48 (*cited in* Desimone 2016). A more recent synthesis by Raphael et al. (2018:321) calculated overall average nest success rate of 0.33 in a given year and seems more appropriate to use; this would yield between 9.4 – 18.9 birds for 2-4 nests, for an average of 14 birds, instead of the HCP calculated average of 22.5 (15 – 30) birds calculated using McShane (2004) rate. By this more realistic nest success assumption, the parcel mitigation combined with the net removal mitigation does not fully offset the take.

AGY-1-8 The net removal model (HCP 6.1.3.4, p 72-74) calculates the derelict net removal will result in the equivalent of about 1.8 murrelets per year (53.2 over project life). However, applicant's marine net removal program contribution for compensation of murrelet fatalities at the Skookumchuck site relies on key model assumptions such as 9.5 to 15.2 nets per year must be removed, which the Service should require yearly reporting and adaptive management triggers for subsequent years to ensure correct outcomes to monitor mitigation targets, and that Western Straits Foundation have such funding capacity provided by the Applicant.

AGY-1-9 While derelict net removals by Western Straits Foundation, principally operating in Salish Sea, benefits a variety of marine-dependent organisms, the direct effect of net removals to the Skookumchuck murrelet population is unknown. It is not stated (or likely known) in the HCP the proportions of Skookumchuck murrelets that feed in either the Pacific Ocean or in Puget Sound. Flight directions of murrelets crossing ridges in the study area show a distinct possibility that birds could be flying to the Pacific as well. If this were known, then removing derelict nets in only Puget Sound conceivably reduce the likelihood of Skookumchuck murrelets lost through entanglement there, but does not compensate for the taking of murrelets that fly to the Pacific Ocean to forage. As such, the claim made in the HCP that "…the conservation parcels and the reduction in murrelet mortality from the net removal program are projected to fully offset the requested take" could be misleading.

Eagles

The project proposes take of 66 Bald and 23 Golden Eagles. We support the use of Identiflight technology, and this should be used and data collected from the onset of project operations with no delay. WDFW does not prefer the retrofitting of wooden power poles, as presented, as compensatory

AGY-1-10 mitigation for take of Golden eagles. A specific utility-scale approach (i.e. partnering with a utility) is not consistent with the current management of mitigating golden eagle electrocutions and has been replaced by a landscape perspective that supports a collaborative approach to developing a regional golden eagle electrocution model (Mojica et. al. 2018). WDFW recommends that compensatory mitigation for the take of golden eagles initially support the on-going work of the USFWS Western Golden Eagle Conservation Team in completing the Columbia Plateau (ID, OR, WA) model to identify overlap between pole density and eagle use areas to determine high-risk areas for electrocution.

Eagle electrocutions in Washington State occur infrequently. For example, over a 15-year period one utility company identified only five eagle (bald and golden) electrocution/collision mortalities (J. Watson pers. comm.). A summary of 40 golden eagle mortalities in Washington State from 2003-2013, identified that four (10%) were the result of electrocution (Watson and Davies 2015). Loss of golden eagles in Washington State due to electrocution could be minimized by using the model to aid in the prioritization of retrofits regardless of utility ownership.

Other

Wind turbine installations are documented to have substantial impacts to many species of bats and migratory birds. We have yet to see RES's proposed Bat and Migratory Bird management conservation measures that was planned to be made available in the HCP. This analysis, report and proposed conservation measures must be included in the HCP so that the public and agencies can be adequately informed of the potential impacts.

AGY-1-11 In summary, WDFW would ultimately prefer the DEIS *No-action Alternative*, which would eliminate the potential adverse impacts to murrelets. However we would consider an alternative combining DEIS *Alternative 2*, Modified Project Site Design, which would not operate the five eastern-most and elements of *Alternative 3* where turbines T1 through T28 operate under an expanded set of curtailment measures, and which should include our above comments on the proposed HCP for analysis, mitigation and monitoring improvements.

WDFW appreciates the opportunity to provide these comments. Please direct any questions to me so that I can coordinate our response.

Sincerely,

Justin Allegro
Manager, Major Projects and Restoration Division
Washington Department of Fish and Wildlife

Cc: Mark Ostwald, USFWS, Lacey, WA
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

February 13, 2019

Mr. Tim Romanski
U.S. Fish and Wildlife Service
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503

Dear Mr. Romanski:

The U.S. Environmental Protection Agency has reviewed the Draft Environmental Impact Statement prepared by the U.S. Fish and Wildlife Service for the Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marble Murrelet, Bald Eagle, and Golden Eagle in Lewis and Thurston Counties in Washington. The EPA comments are provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Sections 1500-1508) and Section 309 of the Clean Air Act (EPA Region 10 Project Number 18-0026-FWS; CEQ Number 20180285).

The DEIS evaluates the effects of the Service's proposed action to issue the ITP for Project operation and maintenance activities. Three action alternatives and a no-action alternative are considered. Alternative 1 would require Skookumchuck Wind Energy Project, LLC (the Applicant) to implement the Project HCP, which includes avoidance, minimization, mitigation, and conservation measures that promote protection and enhancement of the covered species. Measures include, but are not limited to, seasonal curtailment of select turbines, carrion monitoring and removal, purchase and management of conservation lands, derelict fish net removal, and an eagle power pole retrofit program. A fatality monitoring and adaptive management program would also be implemented. Alternative 2 would not operate five of the 38 wind energy turbines. This would result in a lower level of take being authorized. Mitigation measures would be similar to Alternative 1, however fewer derelict fish nets would be removed. The lowest level of take would be authorized under Alternative 3, which would employ seasonal enhanced curtailment (April 1 to September 30) for all 38 turbines. Additionally, Alternative 3 would include the installation and use of IdentiFlight equipment for the full duration of the 30-year ITP. Mitigation under Alternative 3 would be similar to that under Alternative 2. The Applicant has identified Alternative 1 as their preferred alternative.

We commend the Service for developing alternatives that explore a range of measures to minimize and mitigate take. We also support the proposed mitigation measures identified in the HCP/DEIS. The establishment of conservation easements on private timber land and the removal of derelict fishing nets in the Salish Sea would benefit both listed and non-listed species. We find that each action alternative includes important conservation concepts. To provide agency decision-makers and the public with a fuller spectrum of alternatives consistent with CEQ direction,[1] we encourage the Service to consider the development of an "environmentally preferred" alternative that would incorporate the proposed

[1] CEQ Forty Most Asked Questions: https://www.energy.gov/sites/prod/files/G-CEQ-40Questions.pdf

mitigation strategies from each of the action alternatives. Our attached comments provide more details based on our review of the DEIS.

Effective October 22, 2018, the EPA suspended the inclusion of ratings in our comment letters. Information about this change and the EPA's continued roles and responsibilities in the review of federal actions can be found on our website at: https://www.epa.gov/nepa/environmental-impact-statement-ratingsystem-criteria.

Once again, we appreciate the development of the proposed HCP and DEIS and the opportunity to review and comment. If you have any questions, please contact Teresa Kubo at (503) 326-2859 or kubo.teresa@epa.gov, or Elaine Somers at (206) 553-2966 or somers.elaine@epa.gov, or you may contact me at (206) 553-1841 or nogi.jill@epa.gov.

Sincerely,

Jill A. Nogi, Manager
Environmental Review and Sediment Management Unit

Enclosure U.S. Environmental Protection Agency Detailed Comments on the Skookumchuk Wind Energy Habitat Conservation Plan and Draft Environmental Impact Statement

U.S. EPA Detailed Comments on the Skookumchuck Wind Energy Project HCP and DEIS

Scope of Analysis

The DEIS states on page 5 of the DEIS that the Applicant is requesting coverage for the take of the covered species resulting from operation and maintenance of 38 commercial wind turbine generators (WTGs) and associated infrastructure (including outbuildings, roads, and transmission lines, etc.). We appreciate that project components beyond the WTGs have been included within the scope of analysis. However, to adequately assess the potential environmental impacts associated with these various project components, we recommend that additional detail is needed within the Final EIS. In the absence of this detail, agency decision-makers and the public cannot determine the full extent of potential take or the adequacy of proposed mitigation. We offer the following recommendations to strengthen the FEIS. They are organized by project component:

Power Lines

The DEIS states on page 98 that approximately 17 miles of transmission line would be sited to transmit the energy generated by the Project to the Tono substation. The towers would be either monopole or H-frame structures. The DEIS also states that the route will be determined during the final siting and permitting process but that it will be located within the corridor shown in Figure 5.1-1.

Recommendations:

- The transmission line, along with its buried cable electrical collection system,[2] is an integral component of the overall project. We recognize that there will need to be latitude within the final siting and permitting process to address unforeseen issues. However, to assess potential impacts associated with the siting of the power line, we recommend that the powerline corridor and its electrical collection system be further defined and analyzed within the FEIS. This should include an analysis of terrestrial habitat and waterbodies crossed.
- If the analysis of impacts demonstrates that there are sensitive resources[3] within the proposed powerline corridor, we recommend that consideration of alternative alignments protecting these sensitive resources be considered and incorporated within the FEIS.

AGY-2-1

- Figure 5.1-1 does not appear to illustrate the proposed powerline corridor or the underground collection system. We recommend that Figure 5.1-1 be updated to include this information.

AGY-2-2

- We recommend the FEIS include information about the environmental risks and benefits associated with the proposed tower structures (monopole or H-frame). This should include a discussion of pole heights, number of poles in a span, line configuration, etc. Each of these factors could affect how the transmission line interacts with the covered species.
- Installation of linear corridors, such as powerline and buried cable rights-of-way, may negatively affect wildlife by creating extensive edge habitat, or by modifying the behavior of predators. Linear anthropogenic disruptions can act as travel corridors or barriers for wildlife that can change demographic processes.[4] We recommend that the

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[2] DEIS, pp. 95-96

[3] Sensitive resources include special status plants and plant species of concern, as well as other environmental resources.

[4] E. Burger, M. Masselink, R. Tillmanns, R. Farnholtz, and M. Krkosek (2004). Effects of Habitat Fragmentation and Forest Edges on Predators of Marbled Murrelets and Other Forest Birds on Southwest Vancouver Island. https://www.researchgate.net/publication/255570244_Effects_of_Habitat_Fragmentation_and_Forest_Edges_on_Predators_of_Marbled_Murrelets_and_Other_Forest_Birds_on_Southwest_Vancouver_Island

AGY-2-2 (cont'd)

FEIS consider the potential influence the proposed rights-of-way may have on the behavior of nest predators (particularly corvids).

AGY-2-3

- Power line rights of way can function as prime habitat and corridors for invasive plant species and can contribute significantly to the spread and establishment of weeds. The spread of invasive plants, as well as other flammable native vegetation can increase fuel loads, creating dangerous fire conditions that can threaten powerlines and other facilities within the powerline ROWs. Properly maintained vegetation in powerline ROWs can prevent the spread of invasive species, provide habitat for pollinators, and act as an effective firebreak for the control and suppression of wildfire. We recommend the FEIS discuss how vegetation will be managed within the ROW. We further recommend that an Early Detection and Rapid Response program for invasive species be incorporated into the FEIS. The EPA can provide examples of EDRR programs if requested. If the Applicant proposes to use herbicides to manage invasive species, we recommend that herbicide use be part of an integrated vegetation management[5] strategy that includes a combination of chemical, biological, cultural, mechanical, and/or manual treatments.
- We recommend the inclusion of best management practices to address risks to water quality associated with tower construction and installation. The Federal Energy Regulatory Commission has developed an Upland Erosion Control, Revegetation and Maintenance Plan[6] for linear projects that may serve as a helpful reference.

Roads

The DEIS states on page 97 that approximately 36.5 miles of existing access roads would be improved, and approximately 3.9 miles of new access roads would be constructed. The DEIS also indicates that access routes can be found in Figure 5.1-1. Our review finds that while access is acknowledged as an integral component of the overall project, there is little detail in the DEIS about the proposed road infrastructure.

Recommendations:

AGY-2-4

- We recommend that additional detail is needed in the FEIS to assess the potential impacts associated with the road system. We further recommend that the FEIS consider road surfacing and associated impacts, road alignment and intersection with aquatic and terrestrial habitats, accessibility (i.e., whether these roads would be open or closed to the public), road closure methods and enforcement, and best management practices to address erosion risk.
- We recommend that the FEIS clarify the maintenance status of the roads and whether any of the new or improved roads would be temporary. If temporary roads are proposed, the FEIS should also clarify how and when those roads would be closed (administrative closures, obliteration, etc.).

AGY-2-5

- Roads function as prime habitat and corridors for invasive plant species and can contribute significantly to the spread and establishment of weeds.[7] We recommend that the FEIS analyze the potential for the proposed roads to spread invasive species. The FEIS should also include a discussion of how invasive species will be monitored and addressed when encountered. In addition, the installation of linear corridors, such as

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[5] https://www.epa.gov/pesp/integrated-vegetation-management-fact-sheet

[6] https://www.ferc.gov/industries/gas/enviro/plan.pdf?csrt=12332052324475311848

[7] Geneviève Meunier and Claude Lavoie "Roads as Corridors for Invasive Plant Species: New Evidence from Smooth Bedstraw (Galium mollugo)," Invasive Plant Science and Management 5(1), (1 January 2012). https://doi.org/10.1614/IPSM-D-11-00049.1

AGY-2-5 (cont'd)

roads, may negatively affect wildlife by creating extensive edge habitat, or by modifying the behavior of predators. Please see our recommendations above regarding power lines.

- As stated in the section above, if the analysis of the road alignment demonstrates that there are sensitive resources[8] within the proposed corridor, we recommend that alternative alignments be considered within the FEIS. We recommend that these alternative alignments be incorporated as a component of the alternatives.
- Figure 5.1-1 does not appear to illustrate the proposed access routes. We recommend Figure 5.1-1 be updated to include this information.

Permitting and Water Quality

A new access road is proposed along the bank of the Skookumchuck River and the proposed transmission line alignment would cross Hanaford creek, Packwood creek, 19 unnamed tributaries to Hanaford Creek, and come near Coal Creek (DEIS, p. 100). The DEIS also notes that construction would require vehicles and equipment to routinely cross seven unnamed creeks as well as Eleven, Fall, Laramie, Pheeny, Range, and Run creeks, and to come near Twelve Creek. The DEIS notes that this work will trigger additional state and federal environmental review and permitting requirements. Per the NEPA regulations found at 40 CFR 1502.25(a) and (b), federal agencies must identify and list other federal and state environmental requirements applicable to a proposed action. The NEPA regulations further state that agencies must integrate these requirements "to the fullest extent possible" into the NEPA process.

Recommendations:

AGY-2-6

- We recommend that the FEIS provide additional information about required permitting, and document how permitting requirements have been reflected in the analysis in the FEIS.

AGY-2-7

- The extent to which riparian areas may be impacted by the project is not currently clear. Figure 2.1-1 would seem to indicate that a significant portion of Hanaford Creek could fall within the powerline right-of-way and that a significant portion of Skookumchuck Creek runs parallel to the service road. Due to vegetation removal and management, both the road and the powerline, including its electrical collection system, could significantly affect stream shading. We recommend that the FEIS further define the extent to which

AGY-2-8

water bodies may be impacted by the project, including the nature of the potential impacts, and the specific discharges and pollutants likely to impact those waters.

- We recommend that the FEIS also disclose information regarding relevant Total Maximum Daily Load allocations, the water bodies to which they apply, water quality standards and pollutants of concern. The Clean Water Act anti-degradation provisions will also apply to the project, and we recommend that the EIS demonstrate how the proposed action would prevent the deterioration of water quality in any water bodies that currently meet the EPA-approved State of Washington surface water quality standards.

AGY-2-9

Risk of fires

The DEIS discusses the potential for lightning strikes, fire prevention and fighting measures. However, to inform the projections of take related to the proposed project, we recommend that the FEIS include data and analysis to characterize the risk of fires, factoring in changes in climate and project-related ignition sources. Data from other wind projects in the Pacific Northwest may be helpful to inform the analysis, including the locations, causes, frequencies, extent and severity of fires associated with wind farms and the effects on project area habitats and species.

[8] Sensitive resources include special status plants and plant species of concern, as well as other environmental resources.

AGY-2-10 **Bats and non-covered bird species**

The DEIS states on page 24 that bat activity within the Project Area is relatively high. Ten bat species were identified during surveys, including Townsend's big-eared bat (*Corynorhinus townsendii)*, which is a state candidate species. We appreciate the analysis in Section 4.6.2.3 which estimates that, under the assumed operating plans, each alternative would result in the fatality of over 3,300 bats annually. While this number represents a fraction of the fatalities caused by other anthropogenic sources (DEIS Table 6.2-1), the Skookumchuck project would represent a new and additive source of fatality. Given the projected impact and the uncertainty around future habitat availability, we recommend the inclusion of mitigation specifically tailored to address impacts to bat populations within the project area. We encourage the Service to coordinate with the Washington Department of Fish and Wildlife to identify actions consistent with the *State of Washington Bat Conservation Plan.*[9] This may include managing human access to roosts and surveying potential habitat within the project area and limiting disturbance to those areas.

The DEIS states on page 57 that bird collisions with unguyed stationary towers commensurate with the proposed project's meteorological and WTG towers are estimated to cause 1.16 and 16.6 fatalities per tower per year, for meteorological towers between 196.9 and 295.3 feet tall and WTGs between 393.7 and 492.1 feet tall. The DEIS also states that installation of bird diverters, particularly near wetlands or other riparian areas, would help to minimize collision risks. We recommend that the FEIS preferred alternative include bird diverters to minimize the fatalities of non-covered bird species, which are heavily impacted by collisions with anthropogenic structures.

AGY-2-11 **Environmentally preferred alternative**

We support the conservation measures added within Alternatives 2 and 3, which we find are reasonable, practicable, and prudent means to reduce the taking of marbled murrelets, as well as the number of avian-WTG collisions overall. Specifically, under Alternative 2 the five WTGs nearest the murrelet nesting sites would not be operated; under Alternative 3, WTG operations would be restricted two times per day from April 1 through September 30, which would minimize collision risks for marbled murrelets nesting during the middle of the breeding season as well as early or late in the breeding season (DEIS, p. 73). This extended curtailment would support marbled murrelets as they adapt to climatic changes, which may affect presence and abundance of prey, foraging behavior, timing, success, and ultimate survival. In the FEIS, we recommend that the Service combine these features into one environmentally preferred action alternative to provide needed risk reduction over the life of the 30-year ITP.

Revisions for clarity

The following recommendations are offered to improve document clarity and readability:

- We recommend that the FEIS define terms of art. For example, "gen-tie" is used repeatedly throughout the document but is not defined. Such terms should be defined and included in the list of abbreviations and acronyms in Appendix A.
- AGY-2-12 We note that O&M is defined as "operation and maintenance"; however, the document does not adequately describe what that entails. We recommend that the FEIS clarify what activities are expected to be performed and at what regularity. For example, we recommend a discussion of right-of-way maintenance timing and methods, line and road maintenance activities, and activities associated with maintaining the WTGs.

[9] WDFW, 2013. State of Washington Bat Conservation Plan. Prepared by G. Hayes and G.J. Wiles. Washington Department of Fish and Wildlife, Wildlife Diversity Division, Wildlife Program. June 2013.

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January 14, 2019

U.S. Fish and Wildlife Service
Attn: Tim Romanski
510 Desmond Dr. SE, Suite 102
Lacey, WA 98503

RE: Comments on Draft EIS for Skookumchuck Wind Energy Project
Docket No. FWS-R1-ES-2018-0095

Dear Mr. Romanski:

Thank you for the opportunity to provide comments to the Draft Environmental Impact Statement (DEIS) for the Skookumchuck Wind Energy Project (the "Project"). Skookumchuck Wind Energy Project, LLC ("SWEP") appreciates the time and effort the United States Fish and Wildlife Service ("Service") personnel have put into reviewing and providing technical assistance regarding the Skookumchuck Wind Energy Project.

The order of the following comments aligns with the structure of the DEIS:

Section 1 – Purpose and Need

An EIS must "briefly specify the underlying purpose and need" for the project at issue. 40 C.F.R. § 1502.13. The DEIS satisfies this obligation by correctly describing the purpose and need for the Service's proposed action, which is to grant an Incidental Take Permit ("ITP") for the Project, in reliance on the proposed HCP. As noted in Section 1.4, the Service is obligated to act on SWEP's application for an Incidental Take Permit pursuant to Section 10(a)(1)(B) of the Endangered Species Act ("ESA") and the Bald and Golden Eagle Protection Act ("BGEPA").

The DEIS also correctly notes, at section 1.2, that SWEP has applied for authorization for the incidental take of marbled murrelets, bald eagles, and golden eagles that may occur as a result of the operation and maintenance of the Project and is not seeking coverage for any incidental take that may occur during project construction. The time between erection of turbine towers and operation of the Project will be short and have little if any overlap with the murrelet breeding season. In addition, fixed structures present limited risk of collision for murrelets and bald and golden eagles.

Section 2 - Alternatives

An EIS's "purpose and need" establishes the goals of the agency's action and the alternatives analysis provides the range of means for achieving those goals. A deferential "rule of reason" governs "both the choice of alternatives [and] the extent to which the [EIS] must discuss each alternative."[1] The "rule of reason" standard provides that an EIS must evaluate sufficient alternatives to permit a reasoned choice, but need not analyze alternatives which are infeasible, ineffective or inconsistent with project purposes.[2]

[1] *City of Carmel-By-The-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142, 1155 (9th Cir. 1995).
[2] *See, e.g., Pacific Coast Fed'n of Fishermen's Ass'ns v. Blank*, 693 F.3d 1084, 1099-1101 (9th Cir. 1012).

No Action Alternative

The DEIS presents two "no action" alternatives. While the "no action" alternative is a thought experiment required by NEPA, SWEP's application satisfies the requirements of the ESA and BGEPA and so the ITP should be issued. The DEIS, in its analysis of Option A, overstates the risk of murrelets being killed by collision with the Project's stationary turbines. As the DEIS recognizes in section 5.3.6.1, collisions with stationary turbines are possible but not likely. The conservative nature of the Service's modeling assumptions (described in section 4.7.1.1 and Appendix B) is demonstrated by the model's output. The estimate that mortality from collision with stationary turbines would average roughly half a bird a year is belied by the absence of real-world evidence.

Alternative 1 - HCP

SWEP appreciates the Service's assistance in developing the HCP, which is Alternative 1 in the DEIS, and is pleased to implement the measures included in the HCP to advance murrelet and eagle conservation, while providing a renewable source of energy from the first commercial wind energy project in Western Washington.

Alternative 2 – Modified Project Site Design

Alternative 2, would effectively eliminate five wind turbines from the Project and, is beyond the scope of the Service's legal authority. In issuing an ITP, the Service authorizes the take resulting from the applicant's activity; it does not authorize the underlying activity (in this case operating a wind energy project). When an agency is responding to an application, NEPA alternatives must be alternatives to the proposed agency action, not alternatives to an applicant's proposal.[3] If an agency does not have authority to prevent a particular impact, then that impact is not an effect of the federal action.[4]

NEPA requires an EIS for a major federal action significantly affecting the quality of the human environment. "Major federal action" is defined to include "actions with effects that may be major *and which are potentially subject to Federal control and responsibility*."[5] "Effects" means the direct and indirect effects caused by the federal action.[6] If an impact is not subject to federal control, then that impact is not an effect of the federal action and is properly outside the scope of NEPA alternatives analysis.

The purpose of the ITP process is to consider the potential impact of the take for which the applicant is seeking authorization and the steps that applicant has taken to minimize and mitigate such impacts. Here, SWEP is not seeking authorization from the Service to construct, or to operate, a wind energy project. SWEP only seeks authorization for take caused by operation of a project with the configuration it has presented to the Service in its application and described in the HCP. The Service does not have the authority to limit the number of turbines in the Project or dictate where turbines are located. Accordingly, different turbine layouts and numbers are not proper NEPA alternatives. The alternatives analyzed in the NEPA process should be structured accordingly. In the Final EIS, the Service should acknowledge that it does not have legal authority to require SWEP to implement Alternative 2.

In addition to the question of whether Alternative 2 is within the Service's legal authority, the Service also should recognize that Alternative 2 is not economically feasible. Under Alternative 2, the lost

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[3] *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 199 (D.C. Cir. 1991).
[4] *Dept. of Transp. v. Public Citizen*, 541 U.S. 752, 766 (2004) (Mexican trucking case).
[5] 40 CFR §1508.18 (emphasis added).
[6] 40 CFR §1508.8.

energy production from fully curtailing turbines T34-T38 would represent a decrease of more than 12-percent of the entire energy produced by the Project when compared to the curtailment scheme proposed by SWEP in the HCP and analyzed by the Service as Alternative 1. There will be no decrease in project capital costs and minimal, if any, decrease in operating costs associated with the lost energy production and associated revenue loss from Alternative 2. This would result in a reduction in the net value of the Project of more than 300-percent, rendering the project economically unfeasible.

Alternative 3 – Increased Curtailment

Alternative 3 would require every turbine in the Project to be curtailed (i.e., not operating) seven hours a day, and would require curtailment almost three months longer than identified in the HCP. Alternative 3 would reduce the Project's power generation by more than 6-percent of the entire energy produced by the Project when compared to the curtailment scheme proposed by SWEP in the HCP and analyzed by the Service as Alternative 1. This represents a 15-fold increase in the amount of curtailment proposed in the HCP. As with Alternative 2, the lost energy production and associated revenue loss from Alternative 3, would come with no decrease in project capital costs and minimal, if any, decrease in operating costs. This would result in a reduction in the net value of the Project of approximately 150-percent, rendering the project economically unfeasible.

In evaluating the HCP under the requirements of ESA, the Service must consider whether SWEP has minimized and mitigated the impacts of take on murrelets to the maximum extent practicable.[7] The applicant's duty to "minimize and mitigate" the impacts of take is a single duty, not separate requirements to be applied sequentially. If the Service concludes, as it has here, that the combined effect of minimization and mitigation measures provided by the HCP more than offset the authorized take, then further minimization of take is not required by the ESA.[8]

Additional minimization, in the form of increasing curtailment beyond what is contemplated by the HCP, is not required by the ESA because the proposed combination of minimization and mitigation measures fully offsets the impact of the Project's requested take authorization. Any incremental benefit that would be derived from increasing curtailment beyond what is called for in the HCP, including an increment substantially smaller than called for by Alternative 3, would produce minimal conservation benefit at substantial economic cost and would prevent the Project from ever operating.

The Service should consider the Project in the broader context of electric power in the Northwest and the potential impacts of greenhouse gas emissions from conventional power generation on murrelets and eagles. As the DEIS recognizes in section 6.2.1.5, climate change poses a threat to most species in the Northwest, as it does throughout our country. The State of Washington has adopted policies designed to reduce carbon emissions from electric power generation, as have other states in the region. The Project is an important part of the shift to renewable power generation in this region, as it demonstrates the feasibility of locating commercial scale renewable energy in western Washington. The package of conservation measures developed to minimize and mitigate for the impacts of the Project are integral to that effort. As are the indirect benefits of advancing the shift to renewable sources of electric power to stem the loss of habitat due to climate change that is acknowledged in section 6.2.1.5.

[7] 16 U.S.C. §1539(2)(B)(ii).
[8] 831 F.3d at 583.

Section 6.2.2 – Cumulative Effects on Marbled Murrelet

The DEIS identifies the loss of nesting habitat as the major cause of murrelet population declines over the past century with approximately 20 percent of remaining murrelet nesting habitat in Washington occurring on private lands in highly fragmented small patches. The conservation lands that would be acquired under the HCP's mitigation measures are intended to respond directly to this loss of historic habitat. The Project's addition of conservation lands will improve the availability of murrelet nesting habitat in southwest Washington, with improvements that are commensurate with the potential impacts of the Project on the murrelet population.

Conclusion

Thank you for the opportunity to offer these comments, and for your continued efforts on this important project. Please feel free to contact me with any questions or concerns.

Sincerely,

Sean Flannery

Director, Permitting – Americas

Skookumchuck Wind Energy Project, LLC

CIT-1

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The is a Comment on the **Fish and Wildlife Service** (FWS)
Notice: **Notice of availability; request for comments.**

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Comment

I think the Skookuumchuck Wind Energy project is a good one; my only concern would be the safeguarding of eagles, hawks and other large and small birds.

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Dec 3, 2018

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CIT-2

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Anytime we can move away from carbon based energy I see it as a positive for not only this area but the world. I realize that
there are examples of carbon reduction programs in other parts of the world and can only hope that there will be more. It would
be so nice to see solar panels on every house and business. Let's do it.

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Date Posted:
Dec 3, 2018

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CIT-3

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Comment

Should a educated person believe Humans really control Earths Climate? Since the Charney Report of the NRC in 1979, the range of expected equilibrium global warming due to doubling carbon dioxide has been stated to be from about 1oC to 5oC. This is simply a statement of the range of results obtained by existing models, and assumes, somewhat illogically, that the correct answer must be in the output of at least one model. However, as frequently noted by the IPCC, the correct answer depends on correctly simulating feedbacks which, at present, are only poorly known and modeled. Despite this uncertainty, there are some aspects of the problem that are somewhat better known. In general, the response to doubled carbon dioxide (or equivalent carbon dioxide where the effect of other anthropogenic greenhouse gases is expressed in terms of `equivalent' carbon dioxide) in the absence of feedbacks is taken to be the response when all other atmospheric parameters are held constant. The changes due to concomitant changes in other parameters are called feedbacks. There is some disagreement over whether one should consider the distribution of temperature change as a feedback. If one does, then the no- feedback equilibrium response to doubled carbon dioxide is about 0.3oC (Lindzen, 1995a); if one does not, then the no-feedback response is about 1.2oC. The latter is much larger than the former because it includes the warming effect at the surface of cooling in the stratosphere. If one takes the latter approach, then the most important feedback is due to upper level (above about 2 km) water vapor. In all existing models (in the original models by explicit assumption), water vapor, the most important greenhouse gas, increases at all levels

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as surface temperature increases, doubling the no-feedback response to doubled carbon dioxide. The presence of the positive water vapor feedback in current models also increases the sensitivity of these models to other smaller feedbacks such as those due to clouds and snow reflectivity. The trouble with climate activist models is that they generally lack the physics to deal with the upper level water vapor budget, and they are generally unable, for computational reasons, to properly calculate a quantity like water vapor which varies sharply both vertically and horizontally (Sun and Lindzen, 1993, Lindzen, 1995). Indicative of these problems is the recent work of J.J. Bates and D.L. Jackson at NOAA who found, using satellite data from infrared sounders, that, on the average, current models underestimate zonally averaged (averaged around a latitude circle) water vapor by about 20%. It should be noted that this represents an error in radiative forcing of about 20 Watts per square meter, as compared with the forcing of 4 Watts per square meter due to a doubling of carbon dioxide (Thompson and Warren, 1982, Lindzen, 1995). More recent observational analyses by Spencer and Braswell (1997), using satellite microwave data, suggest that even Bates and Jackson have overestimated water vapor, and that the DISCREPANCY with models is still greater. Under the circumstances, there seems to be little actual basis for the most important positive feedback in models. Given our INABILITY to detect expected warming in the temperature data, one might reasonably conclude that models have overestimated the problem. There has been no effect on countries from any current change,

CIT-4

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Notice: **Notice of availability; request for comments.**

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Comment

Can renewable energy and endangered bird species coexist? This project is a intersection of two trends in environmentalism, and an excellent opportunity to find a use for the Endangered Species Act which promotes a broad sense of conservation needed to meet pressing environmental problems related to and beyond the species themselves.

The ESA was established amid rampant overuse of natural resources, with little concern for impact on animal and plant species. It has played a vital role in securing the continued existence of many species as forests and sensitive habitat areas have been protected as habitat. However, global climate change poses a threat even greater than these traditional localized concerns. Widespread damage is being done to existing ecosystems and habitat due to the sum total of greenhouse gas emissions driving climate change. Fossil fuels are the single largest cause of this pattern, which poses a much greater extinction risk to more species than any other single threat to a species. Renewable energy, such as the proposed Skookumchuck wind farm, will be vital to transitioning away from the fossil fuels at the heart of this threat to global ecological wellbeing. This context is distinct from other classic implementations of the ESA, such as protecting Spotted Owl forest habitat from aggressive over-logging. It is important to take this difference into account when evaluating such projects: Despite local risk to endangered species, renewable energy development will benefit environmental conditions for the same species concerned here, and many more globally.

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The draft EIS issued by USDFW indicates that the 3 alternatives identified would yield in a relatively small increase in incidental take, compared to the Do Nothing version, in which development is halted at either of two stages. Any of these options constitute an increased take of the species of concern when compared to denying all permits for operation; but this benefit differential is similarly small in scale. Meanwhile the benefit to endangered species from responsible renewable energy development will contribute to livable climatic conditions for many species currently threatened by global climate change.

CIT-4-1

Given the small impact of all of the possible options, this take permit should be granted to the wind farm, given adequate operating protocol to keep incidental take to a minimum. To further strengthen the plan, alternatives 2 and 3 could be combined to further reduce local risk to the birds of concern. This would combine the suggestion of restricting turbine location away from murrulet populations, and limiting operations to accommodate times of increased murrulet activity.

Thank you for protecting our many treasured species, for the future of a changing global climate.
Micah Stanovsky

CIT-5

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Comment

Great idea, better for us all including the fish and birds. Improved energy infrastructure will decrease pollution and improve air quality. Just don't clearcut the forest...

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Date Posted:
Dec 7, 2018

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Katherine Walton
Environmental Risks and Values
Public Comment

Re: Docket No. FWS-R1-ES-2018-0095
FXES11140100000-190-FF01E00000,
Draft Environmental Impact Statement and Draft Habitat Conservation Plan; Receipt of an Application for an Incidental Take Permit for Marbled Murrelets, Bald Eagles, and Golden Eagles; Skookumchuck Wind Energy Project, Lewis and Thurston Counties, Washington

To Whom It May Concern,

Thank you for the opportunity to comment on "Draft Environmental Impact Statement and Draft Habitat Conservation Plan; Receipt of an Application for an Incidental Take Permit for Marbled Murrelets, Bald Eagles, and Golden Eagles; Skookumchuck Wind Energy Project, Lewis and Thurston Counties, Washington". I am an environmental policy graduate student at the Evans School of Public Policy and Governance at the University of Washington in Seattle. I would write in support of the incidental take permit (ITP) for the marbled murrelet (threatened under the Endangered Species Act), the bald eagle and the golden eagle (protected by the Bald and Golden Eagle Protection Act). While the conservation of threatened, endangered, or deeply symbolic species is and should be a key mission of the Fish and Wildlife Service, exceptions should be made in certain cases. I believe that the addition of 38 wind turbines by the Skookumchuck Wind Energy Project, LLC is an excellent example of one of these cases for the following reasons:

1. Wind power is a crucial building block to a carbon neutral economy (Smil 2014).
2. As climate change affects the availability, reliability, and seasonal distribution of hydroelectric power (a major source of inexpensive renewable energy for Washington) it will be necessary to continue to diversify our state's renewable energy portfolio (US Dept. of Energy 2017).
3. As PJM's analysis of the 2014 polar vortex shows, wind power improves grid reliability, especially in the winter months when it may become too cold to run nuclear or coal (PJM 2014).

That being said, I urge the Department of Fish and Wildlife to compel Skookumchuck Wind Energy Project, LLC to build the wind farm in a way that produces the least amount of harm to the aforementioned species. Birds of prey can be disproportionately affected (as compared to other birds) by wind farms due to their vision, but there are ways to position and build wind farms to mitigate some of this damage (Council of Europe 2003).

In summary, I support the incidental take permit for the marbled murrelet, the bald eagle, and the golden eagle by the Skookumchuck Wind Energy Project, LLC because of the importance of wind energy to a carbon neutral future and a diverse renewable energy portfolio for the state.

Katherine Walton
MPA Candidate
Environmental Policy
Evans School of Public Policy and Governance
University of Washington

Bibliography:

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these 38 wind turbines are not necessary and should not be allowed since they are known bird and animals killers. we don't need to move to an animal killing system for power at all. this entire project should be disabled and shut down. it is not worth the killing olf these birds and animals. animals too deserve protection and the open space we save for them should be sacrosanct and not open to any tom dick or harry who comes along with a aprofiteering scheme. that is what this proposal is. I believe this is open space land which we saved for peace and quiet, not for the latest invasion by a profiteer. this is national land owned by 328 million americans. their rightsto have open space that is not utilized by a profiteer need to be preserved and protected. when we have open land that does not mean every profiteer should be able to comein and utilize what they want. we have the miners, the drillers, the roads, the solars, the winds, its time that those profiteers buy the land they want to put their profit making devices on. they don't have an automatic right to invade our open space for their profiteering. this latest\profiteer\needs to be turned down and turned away. this project is a bummer. it hurts massively. we don't need it. vote no. and stop kowtowing to every profiteers who comes along with a plan to destroy our open space.

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jean publieee

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Comment

I am very strongly opposed to issuing an incidental take permit. Not one threatened or Federally protected species must be allowed to be killed by this project!

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Date Posted:
Jan 28, 2019

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CIT-9

U.S. Fish and Wildlife Service
c/o Tim Romanski,
510 Desmond Drive SE, Suite 102
Lacey, WA 98503

From Kurtis Engle
701 1/2 Euclid Way
Centralia WA 98531
kurtis.engle@gmail.com

Regarding the proposed Skoocumchuck wind farm.

I'm against it.

The reasons include doubt about the economic value of of the project in light of the fact the location is productive as is both economically and environmentally and that value would be forgone, a loss on the balence sheet. Doubt also about the energy present in the available wind. I lived at Bandon, Oregon. That wind is often brisk, but is not enough to support turbines on the Coos Bay spit. So Coos Bay didn't build them. And we don't have that wind here, so why would we build a turbine here? The project seems not to pencil out. If there is no gain, why do it? There is a difference between motion and progress and it is important to apply our resources in a profitable direction.

Then there is the fact the project amounts to a bird chopping machine positioned across an avian highway. And there is also the fact that me pointing that out identifies me immediatly as a kook. Who has just now crawled out of the woodwork. That is called bias. It means you want to minimize the importance of the problems in order to make the project go ahead. The correct response is to consider the effect on the Canada Goose should 1 percent get hit on each pass. They would be gone before the turbines wear out, wouldn't they? Then there are the raptors who use the same space as your windfarm as a food source. Many of these large birds are federally protected and all are subject to being suddenly whacked while going about thier business. A business they have been conducting in the very same way for millions of years. A business it is not fair of us to ask them, on pain of 'accidental' death, to suddenly change. And yet, here we are.

The reason I seperate the objections in two paragraphs is ; the first is a matter of calculation. Which could go either way. And no reason to get emotional either way. The topics of the second paragraph are not a matter of dollars and cents. They are things worth vastly more or vastly less, depending on point of view. There is nothing good or bad, but that thinking makes it so. And after all, Nature has it coming. She started it... right? Now that Man is on top, we have the chance to finish her off... right? You want that electric power you have to sacrifice those animals... right? Remember the Spotted Owl, and CHARGE!!... right? Real men don't gripe about simplifying the food web... right?

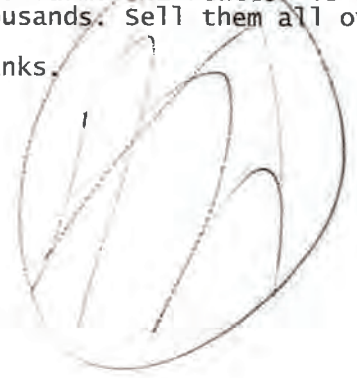
No. Real men point out there is more than one kind of windmill. Some of them don't look exactly like a 1920 style desk fan. Some just dont care the direction the wind is from. Some can be used in close proximity to each other. Some have the machinery on the ground where it cant fall and you can put a wrench on it. Some seem not to be moving at all when viewed from a distance, avoiding visual blight. Some don't kill birds. A few designs have all these advantages.

CIT-9-1

The selection of the correct equipment avoids the problems and the contraversy the problems would cause. Use the vertical axis design least likely to strike a bird and which has the lowest visual impact. And don't put aircraft strobes on the tops. Strobes are real hard on animals, hikers, campers, homeowners with a view of the sky in the general direction, and tourists. Trees don't have strobes, so windmills the same height as trees don't need strobes, ipso facto.

So. Make the right call. And don't build the project. There are far better things to do with the same effort. I want a Liquid Thorium reactor factory where you want to put your wind farm. ONE reactor is worth more that your entire project. And I mean to build thousands. Sell them all over. After putting 100 online under that powerline.

Thanks.



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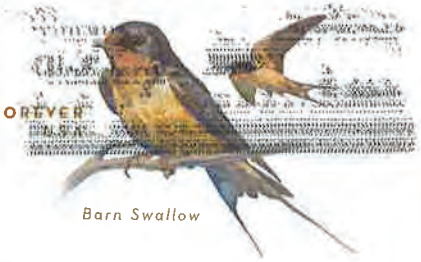

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98503-12691O

January 14, 2019

Docket No. FWS-R1-ES-2018-0095.

Submitted electronically to USFWS via Federal Register Portal

Re: Skookumchuck Wind Energy Project HCP and DEIS

Thank you for accepting the following comments from Willapa Hills Audubon and Black Hills Audubon on the Habitat Conservation Plan and Draft Environmental Impact Statement (DEIS) for the Skookumchuck Wind Energy Project (SWEP).

The marbled murrelet (MAMU) is a small seabird that travels inland to nests in old-growth forests along the U.S. Pacific coast. Marbled murrelet coloration is generally subdued greys and browns with white streaks during breeding season. In-flight activity peaks during hours around sunrise and sunset as the bird travels from aquatic food gathering to its nest. Its habit of nesting in tall timber, its small size, muted coloration and hours of flight activity all conspire to make the bird difficult to identify and track.

The marbled murrelet is listed as threatened by the U. S. Fish and Wildlife Service (1992) and by the State of Washington (1993). A habitat recovery plan was implemented in 1997.

We wish to reiterate the support of Audubon for using wind power turbines to generate electricity. Our opposition is to the choice of location for this particular project, which puts at risk a threatened species, the Marbled Murrelet, which continues to decline throughout its range. Wind energy projects have been proposed at a number of other locations in Western Washington with poor success of completion due to potential impact to Marbled Murrelet survival.

Draft Environmental Impact Study
HCP Appendix B

RES America is requesting an incidental take permit for Marbled Murrelet in conjunction with construction, operation, maintenance, and decommissioning of the Skookumchuck Wind Turbine Project. Data supporting the request was derived from visual, audible (AV) and radar monitoring of the site during the summer 2013 and 2014. Possible radar detection of Marbled Murrelets was 26 in 2013 and 47 in 2014. No Marbled Murrelets were detected by audible or visual inspection.

ORG-1-1 It is the position of the Southwest Washington Audubon Chapters that the observational data collected in support of the incidental take permit is flawed and lacks scientific rigor. More specifically, radar observation of Marbled Murrelet is prone to non-reporting of the presence of birds in flight (false negatives). Additionally, the more accurate method of audible and visual detection by humans provided no confirmation of Marbled Murrelets identified as radar sitings. In its 2003 protocol, USFW stated that “radar surveys can be used as a ‘course filter’ to determine Marbled Murrelet presence.“ (*Methods for Surveying Marbled Murrelets in Forests: A Revised Protocol for Land Management and Research,* Pacific Seabird Group, Marbled Murrelet Technical Committee 2003) The initial study, often sited by radar data collection presentations (as sited in this study by ABR, Inc.), was performed by tethering dead

ORG-1-1 (cont'd)

rock doves from helium-filled weather balloons. *(Cooper, B. A., M. G. Raphael, and D. M. Evans. 2001. Radar-based monitoring*). Rock doves are significantly larger than Marbled Murrelets. That research has been debunked.

Previous to this application, Willapa Hills Audubon performed a scientifically rigorous analysis of radar data during permit application of the Radar Ridge Wind Turbine Project (FWS-R1ES-2010-N098). During that process analysis, we determined that the radar data was flawed with respect to collection as well as usage. The RES America data is similarly flawed.

ABR, Inc. employed Furuno FR-1510 MKIII radar tranceivers operating in the microwave X-band. This device is designed for detection and reflection from metallic objects of size greater than the wavelength of X-band microwaves. This is generally considered to be large and small boats, buoys, piers and floating junk. Marine radar performs optimally in clear weather. The X-band radar signal is known to perform poorly in precipitation including the marine layer (personal communications, Shane Ryan, technical support specialist, Furuno USA, Camus WA). It should be noted that detected objects lie in a plane—the water surface. Marine radar is not employed for flying objects as airplanes and MAMU.

Marbled Murrelets are not 100% reflective of the X-band radar waves. Water, as in bird protoplasm, is somewhat reflective and somewhat absorptive. Hence, the reason a microwave oven cooks food at different temperature. The absorbed waves create heat as they discipate in the meat. At X-band, most of the radar signal is absorbtive. Table 1 is a quantitative example of the detection limitations of X-band systems called the Radar Cross Section (RCS)--also called the scatter coefficient. Some objects have a large RCS due to their large size, high reflectivity and flat perpendicularity to the radiation source. The following table compares the RCS of several different objects:

Table 1—RCS for Point-Like Objects

Target	RCS [m^2]	RCS [db]
birds	0.01	-20
man	1.0	0
cabin cruiser	10	10
automobile	100	20
truck	200	23
corner reflector	20379	43.1

(Table from: M. Skolnik, "*Introduction to Radar Systems*", 2nd Edition,McGraw-Hill, inc 1980, page 44. The RCS of the corner reflector is given for a triangular reflector with a length of 1.5 m.)

The table clearly shows. that birds have an RCS 100-times smaller than a man and 1000-times smaller than a small boat. Furthermore, the RCS of a bird will fluctuate depending upon its aspect angle and the position of its wings (see Mark Desholm, D. (Tony) Fox and Patrick D. Beasley, *Best Practice Guidance for the Use of Remote Techniques for Observing Bird Behaviour in Relation to Offshore Wind Farms*, 2004).

We believe that the issue of Marbled Murrelet's small radar cross section puts serious doubt to the data collected by ABR, Inc. Many researchers have determined that a reliable second method of

Marbled Murrelet identification be part of any study to support the radar data. Tom E Hamer of Hamer Environmental co-authored Appendix A of the Pacific Seabird Group (PSG) *Method for Surveying Marbled Murrelets in Forests: A Revised Protocol for Land Management and Research*, 2003, stated "we stress that concurrent audio-visual observations (at the radar lab) and radar observations be made, at least initially at each site (and preferably each day), to assessthe relative abundance of potentially confounding species and to help filter out non~murrelets from the radar database." (p. 73).

With the Furuno FR-1510 MARK-3. receiver "front end" noise figure of 6-db, the radar device will have difficulty displaying distant Marbled Murrelet images as they will likely appear within the screen's noisepattern (personal conversation, Shane Ryan, technical support specialist, Furuno USA, Camus WA). Video filtering will not improve the display of distant Marbled Murrelets since the observed screen noise is not reflected noise but Johnson-Nyquest noise and shot noise that derives from thermal atomic collisions within semiconductors in the radar receiver. Ultimately, that gives rise to detectable statistical fluctuations in a measurement.

Finally, the size and shape of Marbled Murrelets is counter to reliable detection by marine radar operating in the X-band. Wavelengths for X-band are in the centimeter range. For the Furuno FR-1510 the wavelength is given frequency = 9.410-GHz and speed of light (c) = 300,000,000-m/s therefore the wavelength = freq/c = 3.14-centimeters.

This is slightly less than the body length of an adult Marbled Murrelet (sans feathers, head and neck). Their (vertical) thickness, as observed in flight, is about 2-centimeters. There is an electrical from physics that a radio wave cannot go through a space smaller than it's wavelength. Similarly, a radio wave cannot reflect off of an object smaller than its wavelength. Marbled Murrelets do not meet the physical requirements of wavelength reflection except in the circumstance of flight broadside (tangential) to the radar beam. Then, only one polarization of radar waves meets the detection criteria. The vertical-sensing radar meets this criteria—the horizontal rotating radar does not.

Conclusion:

ORG-1-2

Audubon has demonstrated that a number of errors in usage of marine radar by ABR, Inc. to survey Marbled Murrelets on the project site. We conclude that the incorrect methodology employed has generated poor data related to Marbled Murrelet passage rates. The radar data was not confirmed by visual and audible detection. Since detection of Marbled Murrelet is possible, under ideal conditions using X-band radar, it is likely that some, but not all bird sitings were realized. It is our conclusion that RES America has grossly understated the number of Marbled Murrelets present adjacent to the proposed Skookumchuck project.

Bullet points to be considered by USFWS:

1. USFW protocol suggests that radar detection of MAMU be confirmed by observation and that radar should be used as a "course filter;"

2. The Furuno marine microwave is not designed to detect protoplasm;

3. MAMU present to radar signals with small dimensions, except in ideal circumstances, as compared to the radar wavelength;

4. Radar "front-end" noise effectively masks reflections from MAMU at distances over 1-km.

Our thanks to you for you diligent efforts regarding this important project.

Larry Brandt, Conservation Chair, Willapa Hills Audubon

Charlotte Persons, Conservation Committee, Willapa Hills Audubon

Maria M. Ruth, Conservation Committee, Black Hills Audbuon Society

Sam Merrill, Chair, Conservation Committee, Black Hills Audubon Society

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Black Hills Audubon Society is a volunteer, non-profit organization of more than 1,300 members in Thurston, Mason, and Lewis Counties whose goals are to promote environmental education and protect our ecosystems for future generations.

January 14, 2019

Docket No. FWS-R1-ES-2018-0095.

Re: Skookumchuck Wind Energy Project HCP and DEIS

Thank you for taking the time to consider the following comments on the Habitat Conservation Plan and Draft Environmental Impact Statement (DEIS) for the Skookumchuck Wind Energy Project (SWEP).

The Black Hills Audubon Society represents 1,300 members in Lewis, Mason, and Thurston Counties. This project is of special interest to us because the proposed project our chapter covers conservation issues in the area of Southwest Washington where this proposed project is sited and where wildlife populations potentially impacted by the project occur. As one of the 450 local chapters of the National Audubon Society, we support Audubon's stated position on wind-energy:

> *"Audubon strongly supports properly sited wind power as a renewable energy source that helps reduce the threats posed to birds and people by climate change. However, we also advocate that wind power facilities should be planned, sited, and operated in ways that minimize harm to birds and other wildlife, and we advocate that wildlife agencies should ensure strong enforcement of the laws that protect birds and other wildlife."*

We appreciate the work RES-Americas and partners (the Applicant) have done to respond to some of our concerns expressed in several in-person and phone meetings we had with the Applicant and partners (Chambers Group, West, etc.) as well as in our comments submitted to Lewis County and the US Fish & Wildlife Service on the SEPA and NEPA reviews, respectively, during of these agencies' preparation of their Environmental Impact Statements for this Project.

Given that federal guidelines governing wind energy development are voluntary, not mandatory, the Applicant's efforts to develop a Habitat Conservation Plan to cover its

Incidental Take Permit associated with this project are commendable and may help set an important precedent for future wind-energy projects on private property.

We are pleased about the Applicant's efforts to reduce the incidental take of Bald and Golden Eagles by deploying the Identiflight technology for turbine curtailment at the start of the operational phase of the project instead of waiting for two years or until the proposed take limit of these eagles is approached.

We appreciate the downward adjustment of the turbine-avoidance rate of marbled murrelets, the new curtailment scenarios intended to minimize take of marbled murrelets, and the Applicant's exploration of novel mitigation measures to offset the projected take of marbled murrelets.

Ideally, any wind-energy project implemented for the purpose of reducing greenhouse gas emissions associated with energy production should also reduce the impact of climate change. In so doing, such projects should ultimately benefit vulnerable wildlife species and not, through fatal interactions with project infrastructure, contribute to the reduction or potential extirpation of these very same wildlife species.

We do not underestimate the significance of this project to set a precedent for future wind-energy projects, particularly those deemed to have a significant adverse environmental impact and especially those adversely impacting special-status wildlife species. Our comments outlined here are submitted to encourage the Applicant and reviewing agencies to develop the components of a model wind-energy project, one that our Audubon chapter can support.

HCP

HCP 1.6.1 Alternatives Considered

The Applicant has not presented a reasonable set of alternatives in their HCP to minimize the take of marbled murrelets. Year-round curtailment of 10 turbines (HCP 1.6.1.2) and 38 turbines (HCP 1.6.1.3) are not reasonable alternatives and are a distraction in the HCP given that murrelet activity between September 30 and March 30 is minimal. Based on values in **Table 8 in 5.1.2.2.12** it would seem reasonable for the Applicant to have considered an alternative that encompasses the full breeding season to better reflect murrelet breeding biology.

ORG-2-1 The Alternatives presented in the DEIS and draft USFWS HCP (USFWS 2018) include Alternatives that better align the Project with actions to promote the conservation of murrelets as identified in the Recovery Plan for the marbled murrelet (USFWS 1997): We support an Alternative that would include the following components: As described in Alternative 2 (USFWS 2018, DEIS S-2 and 2.4) the five turbines closest to documented marbled murrelet nest locations would not operate (ideally, they would not be constructed given probability of fatal collisions with stationary objects such as turbines).

ORG-2-1 (cont'd) As described in Alternative 3 (USFWS 2018, DEIS S-3 and 2.5), all operational turbines would be curtailed during dawn and dusk periods during marbled murrelet breeding season (April 1 and September 30). Alternative 1 (USFWS 2018, DEIS and 2.3, the

ORG-2-2 Habitat Conservation Plan) is only acceptable if the final plan includes a revised Population Viability Analysis (PVA) based on best-available science regarding murrelet breeding age, reproductive rate, and commuting sex ratio; the HCP should use the revised PVA not only to recalculate murrelet take estimates but also to recalculate mitigation measures (i.e. amount of conservation land and number of removed derelict fish nets). Detailed comments on the HCP are provided below.

HCP 1.7.4 Bald and Golden Eagle Protection Act

ORG-2-3 In light of the December 22, 2017 memorandum opinion issued by the U.S Department of the Interior concluding that the Migratory Bird Treaty Act (MBTA) does *not* prohibit the incidental take of migratory birds, we iterate our request to have the *Bird and Bat Conservation Strategy* (BBCS) completed within the framework of the EIS *before* construction of the project, not after construction (or "post operation") as is the intention of the Applicant (HCP 2.1) The completed *Bird and Bat Conservation Strategy* should be made publically available prior to project construction.

HCP 2.3 Covered Activities

ORG-2-4 The Covered Activities should include activities during the construction phase of the project (not just operations, maintenance, and decommisioning). The potential impacts during the year-long construction phase, especially the risk of avian collision with the stationary and/or non-operational wind turbine generators (WTG), installation of the 17 miles of gen-tie support structures and gen-tie lines, and guyed meteorological towers should be included in the final EIS and HCP. The Applicant has determined that take is "not reasonably certain to occur during the construction" of the project but has not provided convincing evidence to support this conclusion. For Marbeld Murrelets,the collision risk for non-operational turbines approaches the risk for operational turbines—0.0428 and 0.0500, respectively (HCP 5.1.2.2.6). The Applicant's mitigation measures should be adjusted (increased) to offset potential additional take of Marbled Murrelets during construction.

ORG-2-5 To better document the potential avian collision risk at the Project site, the HCP and Final EIS should include additional avian studies in the unsurveyed northwest end of the WTG line as well as along the 17-mile gen-tie corridor. The avian activity study conducted at the project site (HCP Appendix B) detected 68 bird species in the vicinity of nine survey stations; four of these survey stations were located in the proposed northern line of turbines subsequently eliminated from the project; five survey stations were located in the proposed southern line of turbines but only in the southeast end of this line (see map below from HCP Appendix B, Figure 2 with circles and labels added for clarity).

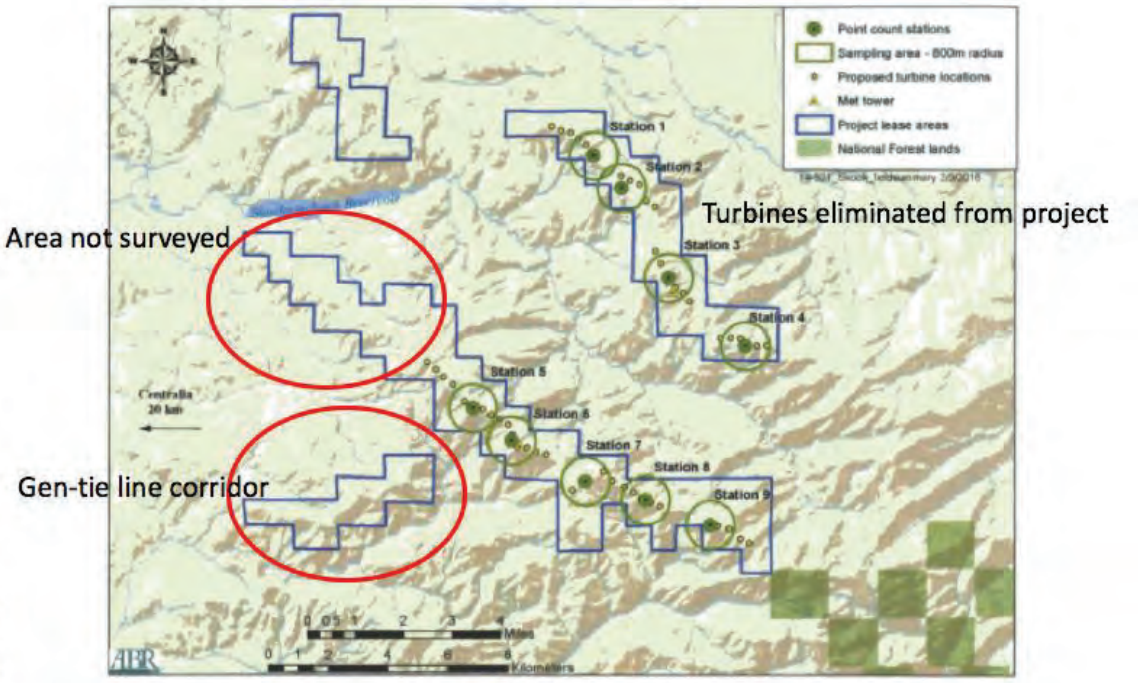

Figure 2. Map of diurnal avian point count stations at the proposed Skookumchuck Wind Energy Project, Lewis and Thurston counties, Washington.

Skookumchuck Avian Study

The HCP (and final EIS) should include results from these additional surveys for a more accurate study of avian activity at the project site for more accurate assessment of potential impacts to Marbled Murrelets, Golden Eagles, Bald Eagles, and the following avian and bat species:

- Peregrine Falcon (federal species of concern, state sensitive species)
- Northern Goshawk (state candidate species)
- Olive-sided Flycatcher (federal species of concern)
- Pileated Woodpecker (state candidate species)
- Vaux's Swift (state candidate species)
- Townsend's Big-Eared Bat (state candidate species)
- Long-eared Myotis (federal species of concern)
- Long-legged Myotis (federal species of concern)

Additional radar and visual studies of Marbled Murrelets at the project site should be conducted along the 17-mile gen-tie corridor, and Project areas not included in the 2013 and 2014 radar and visual study.

The Applicant states that it will assume "legal liability for take resulting from construction" but there are no details on how take will be assessed during the construction phase of the project nor details on how this liability will result in meaningful

actions to minimize or mitigate that take. The Applicant should clarifiy who is responsible for assessing, minimizing, and mitigating potential take during the construction phase of the project.

HCP 3.1.1.3 Occurrence in the Permit Area

ORG-2-6

The Applicant should not assume that murrelet flight heights detected through radar studies conducted in the area of the WTG line are similar to those in the gen-tie line corridor given the differences in topography and elevation of the land between the WTG line and gen-tie corridor.

The Applicant states that, based on radar data, the mean flight height of murrelets in the project area relative to the project ridge line area is 219.3 +/- 34.6 meters above ground level (agl). The Applicant states that the proportion of murrelet flights *below* 150-meter-high WTG height was 0.402. This flight altitude also puts a signficant porportion of murrelets at risk for colliding not only with the WTGs but also the 35-meter-high gen-tie line support structures in the gen-tie corridor. The HCP should include data on flight heights of murrelets from radar studies in the 17-mile-long gen-tie corridor where an estimated 120 support structures are planned.

The collision risk assessment does not acknowledge that poor weather conditions, fog, heavy rain, and low cloud ceilings cause murrelets to fly at low elevations (Mack et al. 2003). The Project is located in an area of Washington where these types of weather conditions are common in winter, spring, and fall, further increasing the likelihood of collision with structures in the project area.

HCP 5.1.1 Direct and Indirect Impacts to Murrelets

ORG-2-7

The Applicant refers to evidence suggesting that collisions with stationary and moving objects may occur as “anecdotal.” The Applicant’s source for this “anecdotal” information is a summary of knowledge—in 1997—of the marbled murrelet in *The Birds of North America* (Nelson 1997) which the author (Kim Nelson) stated is “totally outdated” (personal communication with M. Ruth, 11/21/2018).

The Applicant should not base its dismissal of collision risk on data once perceived to be anecdotal, but seek out best-available science. (See Mockrin, Miranda H.; Gravenmier, Rebecca A. 2012. Synthesis of wind energy development and potential impacts on wildlife in the Pacific Northwest, Oregon and Washington. Gen. Tech. Rep. PNW-GTR-863. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55 p.)

The Applicant should not use “anthropomorphic” when it means “anthropogenic” to refer to structures associated with mortality of murrelets or other wildlife.

The Applicant's assessment of the risk of murrelets colliding with the construction of the 17-mile-long gen-tie line as "low" and is based on several factors including "lack of a discernable flight corridor along the gen-tie line." (DEIS 3.4 p. 39-41). The Applicant should conduct additional studies to determine passage rate, direction, and height of murrelets in the entire 17 mile-long gen-tie corridor.

This data should be used by the Applicant to help better inform calculation of potential take and mitigation during construction and operation phases. Any potential Increase in collision risk should be factored into a recalculation (i.e. increase) of suitable mitigation measures to fully offset a potential increase in take.

HCP 5.1.2.4

It is unclear how much annual take (annual rate and total over 30-year permit) the Applicant is requesting for Marbled Murrelets. This section states that the Applicant is "seeking authorization for annual take of 2.496 murrelets/year x 30 years =74.89 individuals (rounded to 75 murrelets). In Section 4.7.2.1.1.1 of the USFWS's DEIS, the level of permitted take is 85 murrelets, 75 from direct impacts and 10 from indirect impacts (USFWS, 2018). The final EIS should clarify the level of take the ITP allows and ensure that the mitigation measures reflect the take level.

HCP 5.1.2.5 Indirect Effects

ORG-2-8 That 25.9 percent of murrelet flights occurred outside the 3-hour period around dawn during the radar studies conducted by ABR, Inc. should lead the Applicant to consider an alternative that includes curtailment of turbines during the day and during the the 3-hour period around sunset. Murrelet chicks typically fledge around sunset and are especially vulnerable on their first-ever flight from the nest to distant salt water. Recall that murrelet chicks do not make practice flights, they do not fledge in groups, they do not follow their parents on a learned, hazard-free flight path to Puget Sound or the Pacific Ocean. The chick is especially vulnerable during this solo first flight.

ORG-2-9 Applicant estimates that 0.55 fledglings are produced per year, per nest (aka "nest success"). This overly optimistic estimate is attributed to McShane 2004, but upon reviewing section 4.89 of this report, found that this report was focussed on murrelet nest success relative to habitat conditions; nest at interior forest locations had a success rate of 0.55 and nests located within 50 meters of forest edge had a success rate of 0.38 (McShane 2004). The nest success rate in Washington for 20 nests studied during the period of 2004-2008 was 20% (so 0.20 fledglings per year). (Desimone 2016). An overall nesting success rate of 0.33 from all studies combined is reported by the USDA Forest Service (Raphael et al. *in* Spies et al. 2018). The HCP should include calculations based on a less optimistic rate of 0.33 chicks per nest per year.

The EIS should support or dismiss the seemingly counterintuitive statement by the

Applicant that the “fledglings make a relatively small contribution to future population growth” and “the loss of these fledglings is negligible in terms of population dynamics and in terms of the impact of the take” (page 42).

ORG-2-10 The Applicant states the breeding age of murrelets is 2 years. Though there is no consensus on breeding age, it is generally stated as *between* 2 and 5 years (McShane 2004). Adults are classified as at least 3 years old; juveniles and subadults between 1 and 2 years of age (Raphael et al., 2008). The Population Viability Analysis prepared for the Washington Department of Natural Resources for its Long-Term Conservation Strategy for Marbled Murrelets classifies a 2-year-old murrelet as a “sub-adult” and “breeders” to be at least 3 years old (Peery and Jones 2018).

The Applicant’s Population Viability Analysis (Appendix E) should be adjusted to reflect a more conservative (less optimistic) range of breeding ages in order to correctly offset the take of marbled murrelets through mitigation measures proposed in its draft HCP.

HCP 6.1.2.2 Minimization Through Project Operations

ORG-2-11 The Applicant’s proposal for seasonal curtailment of WTGs to minimize take of marbled murrelets during operation of the WTGs may not be adequate to minimize estimated take. The Applicant proposes 3-hour morning curtailment of 10 WTGs from May 1 to August 9 for first 3 years of operation. While this was documented as a high-use flight period, this curtailment does not take into account pre- and post-sunset flights of murrelets, daytime feeding flights, or the critical period around sunset when murrelet fledglings make their first flight to marine waters.

Actual curtailment scenarios in the HCP are too narrow as they are based on confusing and conflicting definitions. “Peak inland activity,” for instance is defined as June-late September; “summer breeding period” and “peak activity period” are both defined as mid-May to early August in the radar studies (ABR 2015); yet for plan the turbine curtailment period the Applicant proposes for minimizing take is only during “high-use flight time,” which is defined by the Applicant as May 1-August 9).

The Applicant proposes installing “flight diverters” on all above-ground transmission and distribution lines to minimize murrelet’s risk of collision during operations. Flight diverters should be installed as soon as practicable *prior* to commencement of operations to reduce risk of collision and potential take. Flight diverters may not address collision risk with the structures supporting the gen-tie lines during *construction* phase before the project is fully operational.

HCP 6.1.3. Measures to Mitigate the Impacts of the Requested Take

ORG-2-12 Mitigation measures should be recalculated according to reproductive rate and more

ORG-2-12 (cont'd)

conservative breeding age to reflect best-available science on murrelet breeding biololgy. Additional acreage should be acquired and/or number of derelict fishing nets should be increased and/or additional mitigation measures should be implemented to fully offset recalculated take estimated of marbled murrelets.

HCP 6.1.3.3 Summary of Benefits of Conservation Parcels

Productivity of mitigation parcels should be recalculated to include revised rate of nest productivity. The rate should be 0.33 fledglings per nest per year (Spies et al., 2018), not 0.55 per nest per year (McShane, 2004).

HCP 6.1.3.4 Net Removal for Project Mitigation

ORG-2-13

The HCP should be more specific in what region of the "Salish Sea" the mitigation activity is planned to occur. The Salish Sea covers 19,925 square kilometers of sea surface and extends from Olympia, Washington, north to the Campbell River in British Columbia and west into the Strait of Juan de Fuca to Neah Bay. The Salish Sea does not include the area of the Pacific Ocean described as the "outer coast," which includes marine waters of Southwest Washington where murrelets nesting in the vicinty of the Project may occur. Given the vulnerability of the population of murrelets in Southwest Washington, the Applicant should consider prioritizing gear-removal efforts in area of Southwest Washington. If Northwest Straits Foundation does not operate on the outer coast, the Applicant should focus gear-removal efforts in areas closest to the Project area in Washington state.

Given the lack of publicly available published information on murrelet bycatch in derelict fish nets, the terms of the Applicant's partnership with Northwest Straits Commission (or other organization) should include the publication of collected data on the numbers, locations, sex, age, and breeding status of any murrelets retrieved as bycatch in derelict gear during this 30-year mitigation activity. For example, the Northwest Straits Commission publishes reports of its work online in its Resource Library (http://www.nwstraits.org/resource-library/).

HCP Appendix E: Population Viability Analysis

ORG-2-14

In its PVA model, the Applicant assumes a 50:50 sex ratio when estimated take of marbled murrelets. The estimate of take of marbled murrelets should be recalculated based on analysis of the PVA submitted in public comments by Dr. Kara Whittaker of the Washington Forest Law Center. Dr. Whittaker's comments present data supporting a sex bias toward males in number of feeding-visit flights—1.8:1 male to female. This ratio should be reflected in the PVA model as it has a signficant effect on the cumulative take numbers and, therefore, a significant impact on the mitigation measures proposed by the Applicant.

HCP 6.3.2. Monitoring Methods Considered But Not Implemented for Fatality

Monitoring

The Applicant should allow for the inclusion of new and more effective technologies that might potentially be developed over the 30-year period, such as technologies for collision avoidance and bird/bat detection (similar to Identiflight but for smaller species). Given the challenges to human observers of visually detecting carcasses of small-to-medium-sized avian carcasses, the Applicant should give serious considering to using detection dogs to increase efficacy of carcass searches.

HCP 6.4.1 Murrelet Adaptive Management

The "Avoidance and Minimization Measures" described in Table 32 should be better aligned with the Applicant's Post-Construction Monitoring (PCM) plan (HCP Appendix G). For instance, it is not clear how the Applicant would revise the duration or hours of turbine curtailment based on carcass searches occuring at 7- to 14-day intervals. The carcass searches described in the PCM should be more frequent during the first year of the plan given the paucity of scientific information about the rate of carcass decay and scavenging rate of the marbled murrelets.

The Fatality Monitoring Plan (HCP Appendix G) should include a significantly larger search area around the turbines given the lack of data on the distance a marbled murrelet (or other bird) would be cast/flung after a turbine strike.

ORG-2-15 The Applicant should provide more detail on its vegetation removal plan in the search area. Given the uneven terrain of the project site and the obstacles (stumps, slash) present in areas cleared for project construction, mowing such an area is impractical if not impossible. If management of vegetation includes herbicide application, this should be considered in the final EIS, especially with regards to impacts of herbicide application on water quality and fish in fish-bearing streams in and downstream of the Project area.

In light of the lack of scientific data about impacts of wind-energy projects on marbled murrelets, the HCP should include a plan and funding for collecting and publishing much-needed data on murrelet collision-avoidance rates, murrelet carcass persistence, murrelet carcass decay stages and rates, post-collision cast distance, and other valuable data. We urge the Applicant to publish and make publicly available this data so proponents of other future wind-energy projects can benefit.

To Conclude

It is our hope that the U.S. Fish and Wildlife Service will, during the respective environmental reviews associated with this project, do everything in their abilities to ensure the proper balance is attained between our need to support clean energy in Washington and our need to protect the vulnerable species and the habitats we share with them.

The Skookumchuck Wind Energy Project has the potential to be a model project but not without considerable additional work on further minimizing and mitigating the impact of the project—from start of construction to eventual decommissioning.

ORG-2-16

The Applicant acknowledges in their draft HCP that the "southwest Washington region has been identified as a high conservation priority by USFWS for increasing the murrelet population in a conspicuous gap in habitat distribution." (Chambers Group, Inc, HCP 6.1.3.1.2, page 65

The EIS should ensure that this project does not exacerbate the decline in existing murrelet population distribution in southwest Washington and northwest Oregon where suitable nesting habitat is already highly fragmented.

We remain concerned that the impact of this project on Marbled Murrelets will contribute to the extirpation of the species in Southwest Washington. Over time, even low rates of project-associated murrelet fatality could lead to the eventual loss of nesting marbled murrelets within this portion of its range. Such an impact would likely reduce the potential for recovering this species in Washington State.

Thank you for your time and hard work on this important project.

Maria M. Ruth,
Conservation Committee
Black Hills Audbuon Society
Olympia, WA

Sam Merrill, Chair
Conservation Committee
Black Hills Audubon Society
Olympia, WA

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AMERICAN BIRD CONSERVANCY

Bringing back the birds

14 January 2019

Katherine B. Hollar,
Acting Deputy Regional Director, Pacific Region, U.S. Fish and Wildlife Service

RE: http://www.regulations.gov Docket No. FWS–R1–ES–2018–0095; Draft Environmental Impact Statement (DEIS) and Draft Habitat Conservation Plan (DHCP, with appendices); Receipt of an Application for an Incidental Take Permit (ITP) for Marbled Murrelets, Bald Eagles, and Golden Eagles; Skookumchuck Wind Energy Project, Lewis and Thurston Counties, Washington

Dear Ms. Hollar,

We are writing to express our concerns regarding the proposed Skookumchuck wind energy project, DEIS, DCHP, and the project's potential impact on birds, particularly the federally Threatened Marbled Murrelet. American Bird Conservancy (ABC) is a 501(c)(3), non-profit membership organization whose mission is to conserve native birds and their habitats, working throughout the Americas to safeguard the rarest bird species, restore habitats, and reduce threats. ABC supports the effort to combat climate change, decrease air pollution, and reduce our dependence on fossil fuels through responsible renewable energy development. However, wind turbines can have adverse impacts on birds, particularly threatened and endangered species.

Bird Smart Wind Energy

ABC's bird-smart wind energy policy adheres to the mitigation hierarchy, which prioritizes decision tiers in wind energy development: "avoid when planning, minimize while designing, reduce at construction, compensate during operation, and restore as part of decommissioning." [1]

[1] May. R. (2017). "Mitigation for birds" in Perrow, M. (Ed.). Wildlife and Wind Farms-Conflicts and Solutions, Volume 2: Onshore: Monitoring and Mitigation. Pelagic Publishing Ltd. pp 124-144.

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ABC supports wind power when it is bird-smart, which means following six principles:

(1) proper siting of turbines away from high-bird-collision-risk areas;
(2) independent, transparent pre-and-post-construction monitoring of bird impacts;
(3) effective construction and operation mitigation by wind energy facilities to minimize bird mortality;
(4) compensation to reduce and redress any unavoidable bird mortality and habitat loss from wind energy development;
(5) environmental compliance with a rigorous local, state, and federal regulatory framework; and
(6) evaluation of wind energy as part of a complete analysis on all feasible renewable alternatives.

This letter focuses on ABC's bird-smart principles 1-3 (i.e., siting, monitoring, and mitigation) in the DEIS, and principle 4 (compensation) in the DHCP for the Skookumchuck project.

We are particularly concerned about the direct and cumulative impacts of the proposed project on the Threatened Marbled Murrelet. The proposal places high risk activities on both sides of the murrelet flyway, from sea (foraging) to forest (nesting) habitat. The developer proposes an incidental take permit of 85 Marbled Murrelets, and proposes to compensate for those losses by producing approximately 85 Marbled Murrelets according to their DHCP. However, as detailed below, the stated compensation is greatly overestimated. Furthermore, the population trajectory of murrelets is in decline and we support actions that help in the recovery trajectory for endangered species, rather than those providing a zero-sum net gain. Any take would contribute significantly to the population decline of Marbled Murrelets, by producing a genetic bottleneck in the Washington population, and threatening the connectivity of the metapopulation in a very important management zone for the species. The developer therefore needs to substantially reduce the proposed take through minimization alternatives and increase the proposed compensation. American Bird Conservancy recommends the No Action alternative under the given scenarios. However, we would be willing to consider a re-analysis of the proposed minimization, mitigation, and compensation measures, with a conservative combination of Alternatives 2 and 3.

ORG-3-1

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We provide our detailed comments under the following headings, which correspond to the information specifically requested in the federal register notice.

(2) The proposed adaptive management framework for marbled murrelets and for bald and golden eagles;

We support the proposed use of Identiflight testing for detection-and-curtailment, however, unfortunately, Identiflight is targeted only towards eagles. We encourage the testing and use of other monitoring technologies that detect other species (Dirksen 2017)[2]. For example, turbine-mounted systems such as vibration/bioacoustics and multi-sensor (MUSE) wildlife detection systems; radar and infrared camera Thermal Animal Detection Systems (TADS); accelerometers, microphones, and video cameras (WT-Bird).

In the DHCP, proposed adaptive management considers the possibility of using dogs to detect carcasses (p. 16 of Attachment G in the DHCP). The use of dogs is ***imperative*** to achieve sufficient detection of carcasses. Additionally, the DHCP proposes searches for carcasses of murrelets in a 140-m x 140-m plot (70-m radius plot) and eagles in a 200-m x 200-m plot (100-m radius plot). Smallwood 2018[3] (p. 13) states the following: "fatality rates are being underestimated because too often investigators and permitting agencies have assumed that disproportionate numbers of fatalities fall straight down or near the wind turbine. This common assumption has justified maximum search radii that fall far short of the area needed to adequately detect available carcasses of birds and bats. Even at the recent wind projects in the [Altamont Pass Wind Resource Area], the search radius of 105 m appears to be too short." Thus, the use of dogs within search radii > 105m should be required.

ORG-3-2

In the DHCP, "mitigation measures intended to benefit the marbled murrelet include acquisition and management of conservation lands to promote the preservation and enhancement of suitable nesting habitat for the species, and funding the removal of abandoned or derelict fishing nets in the Salish Sea." The land acquisition is estimated at $3 million, the net removal at $450,000, and the continued monitoring at about $750,000 (Table 35 of the DHCP). The land acquisition is focused on Willapa Bay (Fig. 16 of the DHCP).

The project proposes establishing conservation easements near the Willapa Bay National Wildlife Refuge, of approximately 600 acres, containing over 300 acres with tree stands up to 75 years old (Tables 24-25 in DHCP). Based on average productivity levels, the DHCP estimates that this will produce 15-30 adult murrelets over the course of the 30-year permit. However, this is an overestimate given the characteristics of the proposed habitat. Parcel A is dominated by Western Hemlock and Parcel B is dominated by Douglas Fir. Murrelets nest in Douglas Firs that are over 150 years old and Western Hemlocks that are 70-100+ years old (Desimone 2016[4], p. 2), therefore this forest is young for murrelets.

ORG-3-3

[2] Dirksen, S. 2017. Review of Methods and Techniques for Field Validation of Collision Rates and Avoidance Amongst Birds and Bats at Offshore Wind Turbines. 47 p. https://tethys.pnnl.gov/sites/default/files/publications/Dirksen-2017.pdf

[3] Smallwood, K.S., Bell, D., Standish, S. 2018. Skilled Dog Detections of Bat and Small Bird Carcasses in Wind Turbine Fatality Monitoring. Unpublished Report

[4] Desimone, S. M. 2016. Periodic Status Review for the Marbled Murrelet. Washington Department

ORG-3-3 (cont'd)

Furthermore, the proposed conservation parcels (600 acres) include only about 300 acres of low quality habitat and are not likely to support the number of birds (15-30) requested for the ITP. In the state of Washington, murrelets nest in low densities amounting to a large quantity of habitat per pair: ">150 ha [370 acres] of habitat per murrelet available" (Raphael et al. 2002[5], p. 340). Therefore, while we encourage the developer to purchase such lands to help support marbled murrelets into the future, as the forests age, 600 acres is not nearly enough to produce 30 murrelets – the acquisition would need to be expanded to 11,100 acres to support that number of individuals. For example, the New Carissa Oil Spill Natural Resource Trustees acquired 3,851 acres of habitat following the recovery of 26 dead Marbled Murrelets[6].

ORG-3-4

To increase compensation for proposed take, the developer has proposed to remove derelict fishing nets to save an additional estimated 53 murrelets and 3-4 two-year olds, through indirect gain. While this is an effective measure for other bird species, such as sea ducks, the estimated gain is based on very sparse data that are not peer-reviewed (USFWS 2017[7]). There exists a lot of uncertainty surrounding how many Marbled Murrelets get entrapped by derelict fishing gear (USFWS 2012[8]).

In summary, the proposed DHCP provides insufficient compensation to reduce and redress unavoidable bird losses.

(3) Potential impacts to the human environment that may occur during the construction or decommissioning phases of the project (e.g., through collisions with construction equipment, stationary wind turbines, or associated infrastructure);

ORG-3-5

The DHCP covers post-construction operational impacts, but we are deeply concerned that the developers are not planning to monitor for impacts during construction. Furthermore, the project may begin construction before the final EIS is determined, and this is likely to disturb Marbled Murrelets. The project needs to set an adequate monitoring baseline against which to measure disturbance to Marbled Murrelets during construction and operations.

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of Fish and Wildlife, Olympia, Washington. 28+iii pp. https://wdfw.wa.gov/commission/meetings/2016/11/nov0416_5_summary_murrelet.pdf

[5] Raphael, M. G., Mack, D. E., & Cooper, B. A. (2002). Landscape-scale relationships between abundance of marbled murrelets and distribution of nesting habitat. Condor, 331-342

[6] https://www.fws.gov/oregonfwo/contaminants/spills/newcarissa/default.asp

[7] USFWS 2017. Biological Opinion 2017-2036 Puget Sound Treaty and Non-Treaty (All-Citizen) Salmon Fisheries. Puget Sound, Washington. Reference 01EWFW00-2016-F-1181. Lacey, Washington.

[8] USFWS 2012. Report on marbled murrelet recovery implementation team meeting and stakeholder workshop. USFWS, Lacey, Washington, April 17, 2012. 66 pp. https://www.fws.gov/wafwo/pdf/FinalReporMarbledMurrelerRITandStakeholderWorkshop.pdf

(4) Biological information and relevant data concerning the covered species and other wildlife;

The region straddles two management zones for MAMU: Zone 1 (Puget Sound) and 2 (Outer WA coast). The PVA conducted in the DHCP, based on at-sea data (with quite a bit of uncertainty), suggests that the population of Marbled Murrelets is declining and will be extirpated from these two sites with or without take. A precautionary approach would support the selection of the No Action alternative to avoid any further impact to the murrelet than the status quo, to maintain connectivity in the metapopulation.

(5) Information on bald eagle, golden eagle, and marbled murrelet collisions with both stationary and moving objects such as wind turbines in the terrestrial environment, particularly in a forested environment;

ORG-3-6

According to the DHCP, "Lighting will be directed downward and shielded, and Federal Aviation Administration (FAA)-required lighting on WTGs will be blinking." This standardized protocol is used to prevent disorientation or attraction to wind turbines at night. However, given that most of the turbine components will be unlit at night, nocturnal curtailment is important to minimize impacts to Marbled Murrelets.

(6) Potential direct, indirect, and cumulative impacts that implementation of the proposed wind project and mitigation/minimization measures could have on the covered species; and other endangered or threatened species, and their associated ecological communities or habitats; and other aspects of the human environment;

Any take would contribute significantly to the population decline of Marbled Murrelets, by producing a genetic bottleneck in the Washington population, and threatening the connectivity of the metapopulation in a very important management zone for the species.

(7) Whether there are additional connected, similar, or reasonably foreseeable cumulative actions and their possible impacts on the human environment including, without limitation, marbled murrelet, bald eagle, and golden eagle, which were not identified in the DEIS;

Other actions should include increased minimization (e.g., full curtailment), and increased compensation (e.g., habitat acquisition); see headers 2 (above) and 8 (below) for more details.

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(8) Other possible reasonable alternatives to the proposed permit action that the Service should consider, including additional or alternative avoidance, minimization, and mitigation measures;

The applicant requested a 30 year take permit of 75 Marbled Murrelets (2.5 individuals per year), plus 10 adult equivalents to cover indirect effects of the take (p. 69 of the DEIS); however, this information is unclear and needs to be stated more clearly in the DHCP. The USFWS suggests 3 alternatives to No Action (which would halt construction and operations).

Alternative 1 issues a take permit at the levels requested by the applicant, but with seasonal curtailment to reduce the estimated take to 65 individuals plus 9 adult equivalents (p. 69 of the DEIS and Table S-1). According to the DHCP (p. 62), the seasonal curtailment (May 1 to August 9) "would occur at 10 turbines (T1 through T5 and T34 through T38) located at the eastern and western ends of the Project for a period of three hours each morning (i.e., 1.75 hours before sunrise and 1.25 hours after sunrise)".

ORG-3-7 Alternative 2 reduces the proposed take of Marbled Murrelets to 58 individuals, and effectively removes the 5 turbines (i.e., prohibits operation of T34-T38) closest to a cluster of known Marbled Murrelet nests (see map in Appendix 5 of the DHCP and Fig. 7 from Attachment A of the DHCP, copied below). The 5 turbines to be removed under Alternative 2 are in close proximity to Marbled Murrelet and Northern Spotted Owl critical habitat[9] in the Gifford Pinchot National Forest (see ABC's Wind Risk Assessment Map). Table 3.7-1 of the DEIS states that to Northern Spotted Owls are not likely to be found in the study area, based on avian surveys. Alternative 2 is absolutely necessary to minimize murrelet mortality.

Alternative 3 further reduces the proposed take of Marbled Murrelets to 38 individuals, and proposes crepuscular curtailment (during dawn and dusk hours) from 1 Apr – 30 Sep, to cover the periods of high foraging activity. "The daily curtailment period would begin 2 hours before sunrise and end 2 hours after sunrise, and the dusk curtailment period would begin 2 hours before sunset and end 1 hour after sunset" (p. 16 of DEIS).

ORG-3-8 Unfortunately, crepuscular curtailment is not enough to minimize impacts to murrelets, particularly given the proposed DHCP compensation package. The dawn/dusk time window corresponds to flights of murrelets into the tree stands (landward), but adults return to sea (seaward) at other times during the day. Furthermore, while feeding their chicks, adults fly back and forth at all times of day (Hamer and Nelson 1995[10]). Therefore, full curtailment during the breeding season (during all hours of the day and night) should be mandatory for all sites with Marbled Murrelets (i.e. all turbines, based on Fig. 7).

[9] https://databasin.org/maps/new#datasets=d15113e3006042bc87714ba557364bc9

[10] Nelson, S. K., & Hamer, T. E. (1995). Nesting biology and behavior of the Marbled Murrelet. In: Ralph, C. John; Hunt, George L., Jr.; Raphael, Martin G.; Piatt, John F., Technical Editors. 1995. Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, US Department of Agriculture; p. 57-68, 152

ORG-3-9 The proposed project is on a ridge, and according to the DHCP, murrelets fly within rotor height. The rotor swept area (RSA) of the proposed turbines is 25-135m; and 8 of 21 murrelet targets flew below 135m, thus within height of the blades (p. 15 in Attachment A of the DHCP). The DHCP conducted a collision-risk analysis using high avoidance rates (90-99%), which are based on no murrelet-specific studies (p. 20 of Attachment A in the DHCP). The DHCP should consider more recent studies to better approximate avoidance rates (e.g., see Kelsey et al 2018[11] for vulnerability scores).

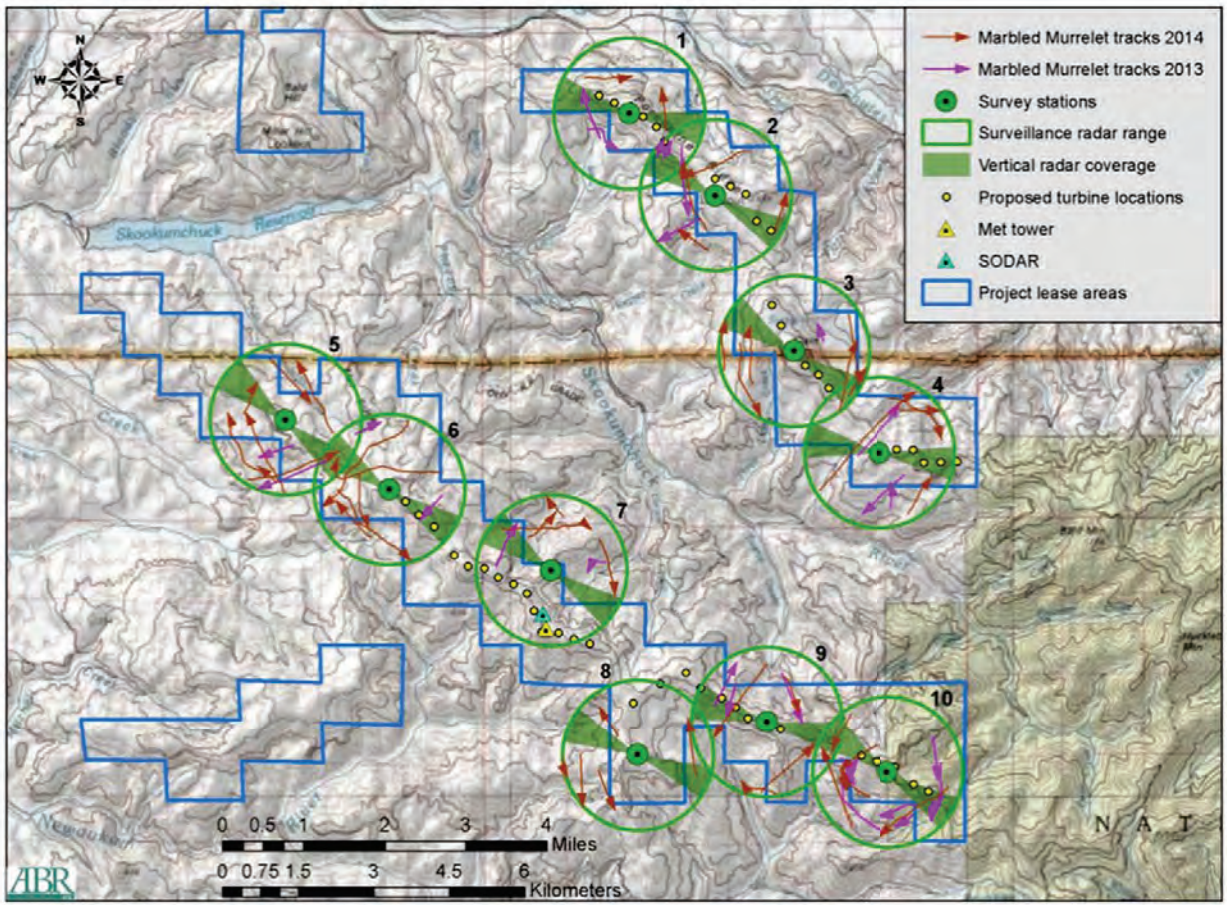

Fig. 7 from Attachment A of the DHCP (p. 14). "Map showing the flight paths of Marbled Murrelet radar targets heading in landward and seaward directions observed before sunrise at each of ten radar sampling stations at the proposed Skookumchuck Wind Energy Project, Lewis and Thurston counties, Washington." Under Alternative 3, the 5 turbines to be removed (T34-T38) would be the ones in the bottom right, near radar survey station 10, where there is a cluster of known murrelets in critical habitat near the Gifford Pinchot National Forest.

[11] Kelsey, E. C., Felis, J. J., Czapanskiy, M., Pereksta, D. M., & Adams, J. (2018). Collision and displacement vulnerability to offshore wind energy infrastructure among marine birds of the Pacific Outer Continental Shelf. Journal of environmental management, 227, 229-247

ORG-3-10 American Bird Conservancy recommends the No Action alternative under the given scenarios in the DEIS and DHCP. The proposed take under the given Alternatives is too high, particularly given the suggested compensation package. However, we would be willing to consider a re-analysis of the proposed minimization, mitigation, and compensation measures, with a conservative combination of Alternatives 2 and 3: remove the 5 southeast turbines and implement full curtailment during the murrelet breeding season.

ORG-3-11 We appreciate the opportunity to comment on this wind energy project, but given the government shutdown, were not able to access all the necessary resources. Therefore, we request an extension to the comment period.

Sincerely,

Holly Goyert, PhD
Bird-Smart Wind Energy Campaign Director
American Bird Conservancy
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https://abcbirds.org/program/wind-energy-and-birds/

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ORG-4

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January 14, 2019

U.S. Fish and Wildlife Service
c/o Tim Romanski
510 Desmond Dr. SE, Suite 102
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(via electronic submittal to http://www.regulations.gov)

Re: Draft Environmental Impact Statement and Draft Habitat Conservation Plan for the proposed Skookumchuck Wind Energy Project (Docket No. FWS–R1–ES–2018–0095)

Dear Mr. Romanski,

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) and Draft Habitat Conservation Plan (HCP) for the proposed Skookumchuck Wind Energy Project (SWEP). I prepared these comments with the assistance of David B. Lank, PhD, University Research Associate and Adjunct Professor at Simon Fraser University, and submit these comments on behalf of Seattle Audubon Society, Conservation Northwest, Defenders of Wildlife, Olympic Forest Coalition, and the Washington Forest Law Center. While increasing the generation and availability of renewable energy are important and necessary goals, renewable energy projects must do greater good than harm by fully minimizing and mitigating for the adverse environmental impacts they incur and by avoiding irreversible impacts. The most likely and potentially significant adverse impacts of constructing and operating the SWEP are to the sensitive wildlife species that could collide with and/or be electrocuted by the 38 proposed turbines, the 17-mile long transmission line, towers, or other project infrastructure within the 22,000 acre project area over the course of the 30-55 years of the project. Below, we identify some potential impacts of the SWEP on marbled murrelets and other sensitive species populations, recommend further analyses for the Applicant, Renewable Energy Systems Inc. (RES), to improve take and mitigation estimates, the monitoring program, and Bird and Bat Conservation Strategy in the final HCP and Final Environmental Impact Statement (FEIS).

Marbled Murrelets

1. Take Estimates and Minimization Measures

ORG-4-1

ORG-4-2

Estimates of the extent the SWEP may take marbled murrelets is especially concerning. Turbines and other project infrastructure pose collision threats to protected species during the construction phase of the project *and* the operational phase, both of which need to be taken into account and permitted. Scientists have documented marbled murrelet collisions with stationary objects including power lines and guy lines (in Oregon) and moving objects including a wind turbine (in British Columbia) and vehicles (in Oregon)[1]. RES reported that collisions are expected while turbines are non-operational: the collision probability and avoidance probability for a stationary, non-operational turbine are not zero (HCP p. 33), and these probabilities also apply to the one-year construction phase. For example, the collision probability for a non-operational turbine (0.0428) differs little from the collision probability for an operational turbine (0.0500). Accordingly, the construction phase must also be part of the FEIS/HCP including sufficient minimization and mitigation to fully offset the associated take. Minimization might include restricting construction to the non-breeding season, when the murrelet collision probability is much lower. If the construction phase is not included in the covered activities, then RES must explain in detail how it "has determined that take is not reasonably certain to occur during the construction or decommissioning of the Project (including for example, road construction) nor during the operation of the Project's generation tie line (gen-tie line)." (HCP p. 12).

With respect to the Population Viability Analysis (PVA), the "Modified Model" is a substantially updated and more realistic version than the earlier "ABR" model (ABR 2015). The updates include: using the lower number of turbines now proposed, accounting for changes in turbine blade design, using more detailed time of day and seasonal traffic rate estimates, and incorporating proposed partial seasonal and daily curtailment of turbine operations at sets of turbines with higher expected encounter rates. We view these changes as positive steps that provide more realistic estimates of take.

Despite these improvements, all model runs are substantially biased low with respect to the effect of take on population growth rate because they assume that take would be comprised of equal numbers of males and females during the breeding season. This ignores the fact that *parental feeding flights are strongly male biased, and thus take would also be so at that time*. In this species with obligate biparental care, sex biases in take (either way) will reduce population growth rate more than was estimated under the assumption of 50:50 take used in the model throughout the year. Based on a simple calculation given below, *we believe that take is underestimated on the order of 31% annually*, but providing more accurate assessment of the cumulative effect of this involves rerunning the analysis. A difference of this magnitude would substantially affect the efficacy of the proposed mitigation measures.

[1] USFWS, pers. comm.

ORG-4-3

The model's estimates of the effects of take on the breeding population size of murrelets incorporate the encounter risk parameter values summarized in Table 8 (draft HCP p. 39). During the breeding season, these are biased low in a non-trivial way because the model did not incorporate a well-documented aspect of marbled murrelet nesting biology, namely a strong male sex bias in provisioning trips (Vanderkist et al. 1999, Bradley et al 2002). The model assumes that take will involve a 50:50 sex ratio throughout the year (HCP p. 45). In fact, the overall sex ratios of 680 murrelets captured during the breeding season while commuting between marine and forest sites was about 1.8 males:1.0 females (Vanderkist et al. 1999), being stronger during evening than morning flights (2.3:1 for PM vs. 1.6:1 in AM; Bradley et al. 2002). Thus the commuting sex ratio varied seasonally, going from about 1:1 prior to the breeding season to about 2.3:1 at the height of the breeding season (Vanderkist et al. 1999). Both male and female parents thus appear to commute more or less equally during nest searching and incubation, but males make a substantially higher proportion of chick feeding visits than females. Biases of similar magnitude were confirmed with radio-tracking data from samples of known nesting birds in the same population (23 females, 25 males; Bradley et al. 2002), again with stronger male biases during the second half of the ~20 day chick rearing period. At two nests where both parents were followed throughout the last 15 days of chick rearing, the male made 2.3 times as many visits as the female.

These data were gathered in British Columbia, but we have no reason to assume that dramatically different patterns occur elsewhere. In the isolated peripheral population studied in northern California, Peery et al. (2004) report the "daily probability of inland flight" by 32 radio-tracked murrelets with respect to season, breeding status and sex. Pooling probable breeders and nonbreeders, they found that 75% of males and 62% of females flew inland on a given day. This appears to suggest a smaller male bias than that found in British Columbia (1.2:1), but the numbers are not comparable with the 'number of trips' metric most relevant to estimating the probability of encounters with wind turbines. Peery et al. do not report the numbers of inland flights made by each sex, which would be the relevant variable for assessing sex bias in encounter risk. The metric reported by Peery et al. underestimates the male sex bias in total flights, and the small sample sizes prevented reporting meaningful sex biases among likely breeding birds only. In contrast, the sex biases reported by Vanderkist et al. (1999) and Bradley et al. (2002) provide robust, relevant, and realistic estimates of sex biases in commuting rates. These are not simply 'the best available information', they are solid and consistent estimates of sex bias in commuting risk during the breeding season that should be incorporated into the PVA scenarios for the SWEP.

This commuting bias means that the take of murrelets by the turbines and transmission lines during the breeding season will also be male biased. Why does this matter? Because this is an obligate biparental caring species, *any sex bias in take will have a stronger negative effect on the number of breeding pairs than would the case under the 50:50 take assumed by the model.* Over time, the local population sex ratio would become more female biased. Females that that lacked partners, although they exist as individuals, would be unable to breed successfully. Males would become the 'limiting sex' to reproductive rate. *As a simple example, removal of 2 birds, 1 male and 1 female, removes 1 pair from*

the population. In contrast, if removals are sex-biased (either way), e.g. for 2 birds = 1.5 males and 0.5 females, the population loses 1.5 breeding pairs.

Typically PVAs model only female populations, for simplicity. This type of effect is not an issue in a more standard loss of nests or loss of habitat PVA, because these affect the sexes equally. The issue arises specifically because of a commuting phenomenon-driven sex bias. If the sex ratios of adult murrelets were male biased to begin with, this male bias in take might not affect the number of breeding pairs. Data from birds captured on the water, plus those of commuting birds early in season, support the assumption that for most of the year, the adult sex ratios of relevant birds are quite even. Thus differential removal of males would operate as outlined above.

The draft HCP states (p. 45): "Initial mean take values were divided by two since the matrix model represents females only, and half of predicted fatalities would be females, again assuming a 50:50 sex ratio and equal risk for males and females. Thus, the alternative simulated mean take values were 0.4852 females per year and 1.2481 females per year."

Given the observed sex bias rather than equal risk, and a biparental breeding system, the more appropriate value to use is not the effect on number of females, but rather the effect on the number of breeding pairs, which in this case substantially higher than the number of females. The correct approach, using information from the report, would resemble the following.

ORG-4-4

Assume that the mortality risk sex bias is substantial only during the chick rearing period, and that the overall bias in flights of 1.8:1 is appropriate. As a simple approximation, for illustrative purposes, we suggest that this could be incorporated into the PVA model by multiplying 1.8 by the cumulative adjustment factor of collision risk for the breeding season only (Jul 1-Aug 9) in HCP Table 8 (itself taken from the modified model, App. D). The 85.80 entry for this period would become instead 85.5*1.8=154.44. The annual total of cumulative adjustment factors for encounter rates changes from 224.36 to 293.00. The difference of 68.64 is *an increase of 30.6%* in 'effect on numbers of breeding pairs', as opposed to the standard PVA 'number of females' calculated under the assumption of 50:50 take.

We cannot provide here more accurate estimates of the effect of incorporating this sex bias in take on the cumulative outcomes of population size, because the PVA model is complex, taking generation times and other factors into account, and annual effects would be multiplicative. It is clear however, that the effects would not be trivial. All the population trajectories incorporating take are biased high and quasi extinction probabilities are biased low (HCP Tables 12, 13; Fig. 14). Focusing on cumulative take, numbers presented in Table 9 of the draft HCP (p. 41) would have to increase by at least 30%, and, given multiplicative effects over time, substantially more. *A conservative 30% effect would thus change the take of 26-75 breeding pair equivalents into 34-98 breeding pair equivalents.*

ORG-4-5

The murrelet sex bias in commuting creates a significantly higher level of take than modeled that must be accounted for to ensure take due to the SWEP is fully offset. The proposed principle mitigation measure of removing derelict fishing nets would, we assume, affect males and females equally. Thus this does not compensate for the commuting sex bias, as proposed. The proposed minimization is that only 10 of the 38 turbines be curtailed and only during the peak morning flight period (a three-hour period beginning approximately 105 minutes before sunrise and ending 75 minutes after sunrise) during a truncated breeding season (May 1 through August 9). Curtailment effectiveness would be greater if it occurred during both the morning *and* evening activity periods (from one hour before official sunset to one hour after official sunset) during the *entire* breeding season (April 1 through September 23), especially in terms of lowering male bias in take. Given the significance of this impact, RES should provide updated estimates of the effect of the turbines on population growth rates taking this sex bias in risk into account. This pattern of curtailment would certainly also benefit multiple other vulnerable bird and bat species as well and should be analyzed in the FEIS/HCP. An even more effective and appropriate strategy would be to more or eliminate from the SWEP the five turbines to be sited closest to known nest sites (within the range of radar survey station #10) and/or other turbines with a high frequency of detections. The FEIS/HCP should evaluate how much these actions can minimize annual take estimates.

ORG-4-6

ORG-4-7

The revised levels of take modeled by RES (0.8395 to 2.4962 murrelets per year) result in the direct mortality of *26 to 75 adult murrelets* over 30 years (HCP p. 41). These rates of take are unacceptable because the seven known nest sites in the vicinity of the project area could easily be *completely eliminated* over the 30-55 year project period. As a result, a biologically important contribution to the geographic distribution of the species in the state would be removed and unlikely to be replaced due to the low reproductive capability of this species in Washington. This possibility was not revealed by the PVA, possibly because the PVA was conducted at much broader scales than the scale of the SWEP or local subpopulation of nesting murrelets. To properly evaluate the likely impacts of the SWEP, the RES should utilize all available survey and habitat data at an appropriate scale (i.e., WRIA or watershed scale) to more precisely define this subpopulation and assess the impact of take on it. RES should consult with WDFW, USFWS, and DNR to assemble these data and identify patterns of nest sites and habitat across landownerships with the landscape, a concept recommended in the DNR HCP and murrelet Recovery Plan:

"Preventing the isolation of breeding colonies and maintaining a well-distributed population will entail considering the location of occupied sites on adjacent ownerships. Developing landscape-wide management plans in cooperation with adjacent landowners for each planning unit as outlined in the federal Draft Recovery Plan for the Marbled Murrelet (USDI 1995) will be desirable. An optimal outcome of such plans would be to have occupied sites in each Watershed Analysis Unit" (DNR 1997 p. IV.44)

RES should ensure that the SWEP does not exacerbate the existing murrelet declining population trend nor the population distribution in southwest Washington and northwest Oregon where suitable nesting habitat is already highly fragmented. Even low rates of take during the construction and operational phases of the SWEP could lead to the eventual

extirpation of nesting marbled murrelets within this portion of its range and reduce the potential for recovering this species in Washington State. Maintaining the distribution of nesting murrelets across southwest Washington is especially important to minimize the high risk of creating a gap in the north-south distribution of the species across its range (USFWS 1997, Raphael et al. 2008).

ORG-4-8 The FEIS/HCP should include an updated PVA to assess the impacts to this local subpopulation. Given murrelets high mobility and dependency on spatially dynamic food

ORG-4-9 sources, the revised PVA should also consider the possibility that murrelets in the seven known occupied sites in the vicinity of the SWEP commute westward toward the Pacific Ocean, not just to the closest marine waters in Olympia. A nest-sea Least Cost Paths analysis for marbled murrelets could provide a more nuanced estimate of movement patterns and should be included in the FEIS/HCP (Barbaree et al. 2015, Lorenz et al. 2016). Murrelets tend to commute between nest and marine locations by flying along the

ORG-4-10 lowest elevation path, such as along river valleys or low ridgelines. According to RES's radar survey data, murrelets frequently traversed the ridge where the turbines are to be constructed and operated, which may represent a disproportionately important movement corridor within the larger landscape. RES can plot a range of nest-sea Least Cost Paths between documented detection points within recent at-sea survey transects and the seven known occupied nesting sites within the vicinity of the project (available from WDFW's murrelet databases). These paths may also incorporate the murrelet flight paths recorded during RES's past and future radar surveys along the ridge of turbines and the transmission line.

2. Mitigation: Derelict Net Removal

RES reports their intent to save a total of 53 adult murrelets by funding the removal of a total of 91-96 derelict fishing nets over the first six to ten years of the project. The potential for derelict net removal to mitigate for the take of murrelets due to the construction and operation of the SWEP must be based on valid assumptions. First, the proposed level of mitigation must be additive to the existing rate of derelict net removal because this is a new, additive source of take that must be offset. Currently, on average 21-28 net pieces are lost from fishing vessels per year and 75% of these are recovered (USFWS 2017). This equates to 16-21 nets being recovered per year. To recover an

ORG-4-11 additional 15 net pieces per year would require a 71-94% increase in effort, and only 5-7 additional nets are estimated to be recoverable per year (the remaining 25%). RES needs to verify and report that the Northwest Straits Foundation has the capacity to increase the rate of net removal to the extent proposed.

Second, to maximize the potential benefit to murrelets, derelict net removal efforts should be focused in areas with the highest year-round concentrations of murrelets. For example, area during the summer months, marbled murrelets forage at the highest densities in the nearshore waters along the Strait of Juan de Fuca, San Juan Islands, Rosario Strait, Admiralty Inlet, and northern Hood Canal. These high priority areas should also be based

on the likelihood of accumulation of lost gear, and the expected safety, effectiveness, and efficiency of survey and removal efforts (USFWS 2017).

Finally, the overall level of mitigation must be increased to account for the additional take beyond the current underestimate due to the murrelet sex bias ratio and the omission of the construction phase of the project (as described above). Similar to the golden eagle, we strongly urge the USFWS to establish a compensatory mitigation rate for the marbled murrelet. The USFWS has set the threshold for authorized take of golden eagles at zero throughout the country unless compensatory mitigation is provided at a rate of 1.2:1 (HCP p. 18). Such a determination seems justified for murrelets too given the species' relative population sizes (greater for golden eagles) and rates of population decline (greater for murrelets) and the need to increase mitigation to compensate for risk and uncertainty in take and mitigation estimates over periods of decades (USFWS and NOAA 2016). If the opportunities for derelict net removal are insufficient to reach the needed level of mitigation, then RES should seek additional conservation easement parcels on DNR-managed lands where many more options exist than on private lands.

3. Mitigation: Conservation Easements

ORG-4-12 Thinning prescriptions within the Management Plan for the conservation easement mitigation parcels should be conservative (precautionary) in order to avoid impacting murrelet reproductive success. The best available science on this specific topic (Raphael et al. 2018) recommends the following:

"Taken as a whole, research to date suggests that…managing forest structure to reduce nest predation risk should be approached with consideration of local factors that might affect predator densities (e.g., overstory thinning that might result in increased abundance of berry-producing early-seral shrubs that attract corvids)" (p. 336).

"Active management actions could include thinning in plantations to accelerate growth of potential nest trees and development of nesting platforms, but care will be needed to prevent simultaneously increasing numbers of nest predators attracted to more diverse understory conditions" (p. 337).

No harvest or road construction should be allowed within occupied nest sites or potential nest habitat. In areas adjacent to occupied nest sites, thinning should only be allowed to enhance or maintain non-habitat with *windfirm and closed* canopies. The goal of thinning harvests within the mitigation parcels should be a 100% habitat target over time as soon as possible, and any harvest-related disturbances less than 100 meters from an occupied nest site should be prohibited during the full breeding season. If these conditions cannot be met, then thinning should not be permitted in or around these areas in order to avoid adversely impacting murrelets.

ORG-4-13 It is appropriate for RES to commit to compensating for any future loss of habitat in the conservation easement parcels due to natural disturbances (HCP p. 96-97). RES

ORG-4-13 (con't) established a threshold number of acres of habitat disturbed to trigger replacement for blow-down (44 acres) or fire (50 acres). The FEIS/HCP should describe how these figures were determined. More appropriate thresholds of significant impact or change in area may be 5% of the total habitat area (9 acres for parcel A and 8 acres for parcel B). Replacement mitigation parcels should provide no net loss of habitat area or quality relative to the lost habitat and ideally be configured in large, contiguous blocks of forest with minimal edges.

ORG-4-14 RES should also describe how it would treat a loss of non-habitat within the conservation easement parcels in the case of natural disturbances.

Monitoring and Adaptive Management

ORG-4-15 Monitoring is a fundamental component of adaptive management and one of the keys to developing a successful HCP conservation strategy (USFWS and NOAA Fisheries 2016). Effective and robust methods for detecting collisions with turbines and other project infrastructure are critical to measure the actual amount of take by the project because pre-construction survey data may not necessarily correlate with post-construction fatality rates (Hein et al. 2013). Because the impacts of the project may persist for up to 55 years (over which time many environmental factors and wildlife populations will change), the monitoring program should quantify the mortality of *all* wildlife species associated with the project for the *full* duration of the permit.

ORG-4-16 We are concerned the frequency of monitoring during the Implementation Phase (limited to years 7, 14, 22, and 30 of project operations) or a further stepped-down approach to monitoring would be insufficient to detect whether or not the level of permitted take is exceeded (App. G, p. 81).

ORG-4-17 The Fatality Monitoring Study estimates that a minimum of 68% of the area where small bird carcasses are expected to fall and 54% of the area where large bird carcasses are expected to fall are within the turbine construction area (App. G, p. 9). These areas are inadequate for detecting the take of murrelets and eagles due to the project. Rather, the carcass search area must be as large as the entire search grid (200 m^2), which often exceeds the area of the turbine construction area (App. G, App. A. Preliminary Civil Design Construction Area and Search Plots). This will likely require the clearing of all trees and other vegetation that could obscure a carcass the size of a murrelet that could be caught in branches or on the ground. Repeated vegetation management (presumably herbicide application) will likely be necessary to maintain adequate ground visibility and search efficiency throughout all search grids, especially in response to fast-growing invasive species (i.e., Himalayan blackberry, Scot's broom). Any logging slash should also be removed to maximize the searchable area (which can also be sold as biomass fuel). Keeping the carcass search areas completely clear will have the added benefit of deterring wildlife use of the areas (for breeding, dispersal, or foraging) and possible collision with the turbines.

ORG-4-18 Most importantly, the effect of increasing the search area is an increase in g, the site-wide probability a carcass is available to be found and detected by searches (App. G, p. 1). If g introduces high levels of uncertainty into the fatality estimates, then exceedance of the permitted level of take is more likely. For murrelets, the estimated g of 0.31 on average during the 3-year Evaluation Phase monitoring period is unacceptably low given the feasibility of the expansion of the carcass search area (App. G, p. 11). Adaptive

management for monitoring can also increase g by increasing the frequency of carcass searches. If adaptive management leads to the use of conservation detection dogs, we recommend the Conservation Canines program at the University of Washington[2].

In addition, minimum values of g should be estimated and monitored for all listed and sensitive species' carcasses observed. The species most sensitive to impacts by the SWEP are those protected by the Endangered Species Act (ESA), the Bald and Golden Eagle Act, and species listed and protected under Washington State regulations (RCW 77.15.120; RCW 77.15.130), all of which prohibit unauthorized take or harassment. For the SWEP these species include:

- Marbled Murrelets (state endangered, federally threatened)
- Bald Eagles (federal species of concern)
- Golden Eagles (state species of concern)
- Peregrine Falcon (federal species of concern, state sensitive species)
- Northern Goshawk (state candidate species)
- Olive-sided Flycatcher (federal species of concern)
- Pileated Woodpecker (state candidate species)
- Vaux's Swift (state candidate species)
- Townsend's Big-Eared Bat (state candidate species)
- Long-eared Myotis (federal species of concern)
- Long-legged Myotis (federal species of concern)

The potential presence of these species at the SWEP warrants additional information gathering and directed biological surveys to enable detection of significant adverse impacts. Specifically, we support the recommendations made by ABR (2015) with respect to bird and bat species (HCP App. C):

"Year-round avian monitoring is recommended to adequately document the diversity and abundance of resident species and to characterize the timing, species composition, and relative abundances of migratory birds."

"Acoustic monitoring studies should be considered during the spring, summer, and fall when bats are known to be active in Washington. Little information is available to predict the time of year when bats may be most at risk because wind power development in forested regions of the Pacific Northwest is just beginning. We would expect fatalities during fall migration (similar to other studies throughout the US) but the added uncertainty of what is expected during spring and summer periods leads us to also recommend spring and summer acoustic monitoring to evaluate bat activity during these important time periods. Species of concern such as the Townsend's big-eared bat, long-eared myotis, and long-legged myotis may require the use of highly sensitive microphones or mist nets to detect the presence of these species that have low intensity echolocation calls."

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[2] http://conservationbiology.uw.edu/conservation-canines/

ORG-4-19

ORG-4-20

Monitoring of all sensitive species can be incorporated into the anticipated Bird and Bat Conservation Strategy (BBCS) Plan *prior* to operations of the SWEP (HCP p. 11) in accordance with the Land-Based Wind Energy Guidelines (USFWS 2012). The BBCS should be developed with concurrence by WDFW and USFWS, based on the best available science, and made this publically available prior to release of the FEIS/HCP. To avoid underestimating the actual level of take, the BBCS should amend deficiencies in past studies on site, such as the acoustic study of bat activity with large horizontal and vertical gaps in sampling which appears to have been conducted irrespective of the availability and proximity of bat roosting or foraging habitat (ABR 2016). The BBCS should also expand the study area to the northwest end of the turbine line as well as along the transmission line corridor (areas yet to be surveyed).

Conclusion

Before construction and operation of the SWEP are approved, the FEIS/HCP should evaluate the potential impact of all project-related infrastructure within the 20,000-acre project area over the course of the 30-55 years of the project on all sensitive and protected wildlife species as well as all migratory bat and bird species (given their greater susceptibility to collisions with wind power infrastructure; Erickson et al. 2014). This includes a revised take estimate, PVA, improved minimization measures, sufficient mitigation, and a robust monitoring and adaptive management program, as described above. All revised analyses should be rigorous, based on the best available science, and peer reviewed.

It is vitally important that RES, the USFWS, and WDFW ensure the SWEP achieves a proper balance between our society's need for clean energy and its anticipated adverse impacts (from construction through decommissioning). By doing so, the SWEP has the potential to serve as a model wind energy project within our region.

Thank you for taking our concerns and recommendations into account.

Sincerely,

Kara Whittaker

Kara A. Whittaker, PhD
Senior Scientist & Policy Analyst
Washington Forest Law Center

On behalf of:
Seattle Audubon Society
Conservation Northwest
Defenders of Wildlife
Olympic Forest Coalition

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January 14, 2019

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Submitted online at : http://www.regulations.gov

RE: Comments on Docket No. FWS-R1-ES-2018-0095

Dear Mr. Romanski:

Thank you for the opportunity to comment on the draft Habitat Conservation Plan ("HCP") for the Skookumchuck Wind Energy Project. The Cascade Forest Conservancy ("CFC")'s mission is to protect and sustain forests, streams, wildlife, and communities in the heart of the Cascades though conservation, education, and advocacy. We represent over 10,000 members and supporters who share our vision of a forest where wild places remain to capture our imagination and allow native wildlife to thrive.

CFC is generally supportive of projects that will reduce our nation's dependence on fossil fuels, such as the Skookumchuck Wind Energy Project, as climate change is the major issue facing our forests today. The intensity and scope of these impacts are likely to increase in the coming years, especially if carbon emissions continue at the current rate. However, wind energy projects should be constructed and operated in a way that minimizes harm to wildlife. We are concerned that the Proposed Alternative, issuance of the permit and implementation based on the Applicant's HCP, because this alternative does not adequately minimize and mitigate take of marbled murrelets, bald eagles, or golden eagles.

ORG-5-1

We support Alternative 2, which eliminates wind turbines closest to marbled murrelet nest sites. We would also support an alternative that more thoroughly considers impacts to birds during construction, the full breeding season of the marbled murrelet, collisions with stationary structures, and the impacts of the estimated take on the local marbled murrelet population. CFC's concerns and comments related to this project are further explained below.

Impacts to Marbled Murrlets during construction should be considered in the HCP.

ORG-5-2 The draft HCP does not provide sufficient detail about how take of murrelets will be assessed during construction of the project. It is also unclear what actions will be implemented to minimize or mitigate take during construction.

To the extent take is considered in the construction phase, the impacts to wildlife are likely underestimated in the draft HCP. The activities proposed during construction include activities that could result in habitat loss, such as logging and vegetation clearing, and habitat disturbance through noise and erosion. The draft HCP also does not adequately address collisions with stationary structures erected during construction. During construction, these stationary structures posing collision risk include wind turbines, gen-tie lines and support structures, and meteorological towers. The HCP should further consider the collision risk associated with these structures during construction, and provide adequate evidence to support these conclusions. Additionally, the HCP should consider the impact of weather conditions such as fog or low clouds on murrelet flight heights, and how these flight patterns could cause collisions along the gen-tie corridor.

ORG-5-3

ORG-5-4

ORG-5-5

Murrelet surveys should consider the full breeding season of the marbled murrelet.

The radar and visual surveys of murrelets at the project site did not consider the full breeding season of marbled murrelets. Two years of surveys were conducted between May 24-August 1 2013 and May 11-August 4 2014. These surveys do not encompass the full breeding season of marbled murrelet in Washington, which is April 1-September 23. These surveys, which did not include two months of the breeding season, could lead to underestimated take estimates. A study that encompasses the entire breeding season in the project area (the 38 proposed turbines and the gen-tie corridor) would provide a better picture of how murrelets use the area and the impact this project will have on the local population.

ORG-5-6

The proposed level of take during operation will have a major impact on the marbled murrelet population in Southwest Washington.

The proposed of murrelets associated with the operation of the turbines, over two per year for thirty years will negatively impact the local population and hinder the recovery of the species in Washington. Southwest Washington is a region identified by U.S. Fish and Wildlife Service as a high conservation priority for marbled murrelets due to fragmented habitat. Murrelets do not reproduce quickly, and murrelets collide with project structures are not likely to be replaced. The HCP should consider impacts to the local, southwest Washington population of murrelets and ensure that the project does not further contribute to the decline of murrelets in this region or further fragment suitable habitat. The impact of the proposed take should be analyzed at the scale of the local population and estimation of nest success and other relevant factors should reflect the best available science for local populations of murrelets.

ORG-5-7

Conclusion

Wind energy projects have the potential to be environmentally beneficial, if they are sited and operated in a way that minimizes harm to wildlife. We believe there are several ways the Skookumchuck Wind Energy Project draft HCP can be improved to better protect wildlife, especially marbled murrelets. The Cascade Forest Conservancy greatly appreciates your consideration of our comments.

Sincerely,

Nicole Budine
Policy and Campaign Manager

Appendix B
Supplemental Information (List of Preparers, Literature Cited, and Abbreviations and Acronyms)

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Nanette Seto	Chief, Migratory Birds and Habitat Program	27	MBTA	
Mike Green	Deputy Chief, Migratory Birds and Habitat Program	27	MBTA, BGEPA	Migratory Bird Management
Jennifer Miller	Chief, Migratory Birds and Habitat Program Permits Branch	8	MBTA, BGEPA	Wildlife Biology
Matt Stuber	Regional Eagle Coordinator	8	MBTA, BGEPA	Raptor Ecology
David Leal	Wildlife Biologist, Migratory Birds and Habitat Program	30	BGEPA, Avian Biology	Wildlife Biology
Michelle McDowell	Wildlife Biologist, Migratory Birds and Habitat Program	25	NEPA	Waterbird Conservation, Wildlife Science
Brad Thompson	Acting Project Leader	11	ESA, NEPA	Fisheries, Fish and Wildlife Biology
Curtis Tanner	Manager, Consultation and Conservation Planning Division	27	ESA, NEPA	Environmental Policy
Tim Romanski	Manager, Conservation and Hydropower Planning Branch	29	ESA, NEPA	Fish and Wildlife Biology
Mark Ostwald	Fish and Wildlife Biologist	30	ESA, Forest Ecology	Fish and Wildlife Biology

Name	Role	Years of Experience	Expertise	Professional Discipline
Vince Harke	Fish and Wildlife Biologist	18	ESA, Marbled Murrelet Ecology	Fisheries Science and Natural Resources
Katherine Fitzgerald	Fish and Wildlife Biologist	14	ESA, Mathematical Biology, Marbled Murrelet Ecology	Endangered Species Biology
Marty Acker	Fish and Wildlife Biologist	19	ESA, Habitat Conservation Planning	Ecology
Kevin Connally	Fish and Wildlife Biologist	18	ESA, NEPA, Habitat Conservation Planning and Implementation	Fish and Wildlife Biology

Anchor QEA, LLC

Name	Role	Years of Experience	Expertise	Professional Discipline
Kim Marcotte	EIS Consultant, Project Manager	15	NEPA Compliance	Environmental Planning
Greg Summers	NEPA Strategy, EIS Review	25	NEPA and Regulatory Specialist	Environmental Planning
Leah Erickson	Project Coordinator, EIS Author	1	Biological Assessment	Environmental Planning
Barbara Bundy, PhD	Cultural and Historic Resources, Tribal Resources	20	Cultural Resources Management, Archeology	Archaeologist
Alexandra Karpoff	Scoping Report, EIS Author	7	Pacific Northwest Ecology, Data Management	Biologist, Environmental Scientist
Vivian Erickson	Environmental Planner, EIS Author	10	NEPA Compliance, Environmental Policy	Environmental Planning
Laura Jardieanu	Environmental Planner, EIS Author	5	NEPA Compliance	Environmental Planning
Nikole Stout	Environmental Planner, EIS Author	2	NEPA Compliance	Environmental Planning
Sarah Currin-Moles	EIS Technical Editor	4	Technical Editing	Product Delivery
Rana Uhl	EIS Technical Editor	9	Technical Editing	Product Delivery
Katie Atkins	EIS Technical Editor	8	Technical Editing	Product Delivery
Zheng Fang	EIS Graphics	11	Graphics	Product Delivery
John Fox	EIS GIS	16	Spatial Data Analysis	GIS Analyst
Calvin Douglas	EIS Biological Resources	22	ESA Compliance	Natural Resources and Planning
Sydney Gonsalves	EIS Biological Resources	6	Quantitative Ecological Analysis, Biological Field Work	Fisheries and Statistics

ECONorthwest

Name	Role	Years of Experience	Expertise	Professional Discipline
Sarah Reich	EIS Author – Socioeconomics	14	Socioeconomics	Economics and Policy Analysis

Turnstone Environmental

Name	Role	Years of Experience	Expertise	Professional Discipline
Jeff Reams	Reviewer for Fish and Wildlife Sections	28	Marbled Murrelets and Northern Spotted Owls	Wildlife Biology
Stephanie James	Reviewer for Fish and Wildlife Sections	21	Terrestrial Species and NEPA Compliance	Ecology

Western Ecosystems Technology, Inc.

Name	Role	Years of Experience	Expertise	Professional Discipline
Chris Nations	Murrelet Surveys and Take Modeling	15	Statistics, Ecological Modeling	Wildlife Biology, Habitat Conservation Planning

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ABBREVIATIONS AND ACRONYMS

Applicant	Skookumchuck Wind Energy, LLC
BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
Covered Species	marbled murrelets, bald eagles, and golden eagles
CRM	collision risk model
CSA	Combined Statistical Area
dBA	A-weighted decibel
DNR	Washington State Department of Natural Resources
ECPG	*Eagle Conservation Plan Guidance*
EDNA	Environmental Designations for Noise Abatement
EIS	Environmental Impact Statement
EMU	Eagle Management Unit
ESA	Endangered Species Act
FAA	Federal Aviation Administration
HCP	Habitat Conservation Plan
HIP	horizontal interaction probability
I-5	Interstate 5
IFPL	Industrial Fire Precaution Levels
ITP	incidental take permit
kV	kilovolt
LAP	Local Area Population
MSA	Metropolitan Statistical Area
MW	megawatts
NEPA	National Environmental Policy Act
NOA	Notice of Availability
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
Project	Skookumchuck Wind Energy Project
PVA	population viability analysis

RCW	Revised Code of Washington
SCADA	supervisory control and data acquisition
Service	U.S. Fish and Wildlife Service
SWPPP	Stormwater Pollution Prevention Plan
USC	United States Code
VIP	vertical interaction probability
WNS	white-nose syndrome
WRIA	Water Resources Inventory Area
WTG	wind turbine generator

Appendix C
Take Modeling

1 Marbled Murrelet Collision Model

A marbled murrelet collision model was used to predict the number of marbled murrelet fatalities based on factors including marbled murrelet presence, WTG design specifications, wind conditions, and operational regimes. The model accounted for variation in these factors by calculating predicted fatalities for different portions of each year (e.g., breeding season), then added the number of predicted fatalities for each time period to get the total number fatalities per WTG per year. These results were then multiplied by the total number of Project WTGs (38) and number of years in the permit (30) to determine the number of marbled murrelet fatalities anticipated from Project O&M.

To determine the number of predicted marbled murrelet fatalities per WTG per year, a progression of events was assumed to occur with specific outcomes assigned at each step. These steps correspond to the major parameters of the model and are shown graphically in Figure C-1. Additional variation related to consideration of the scenarios mentioned previously is not shown but is described further herein.

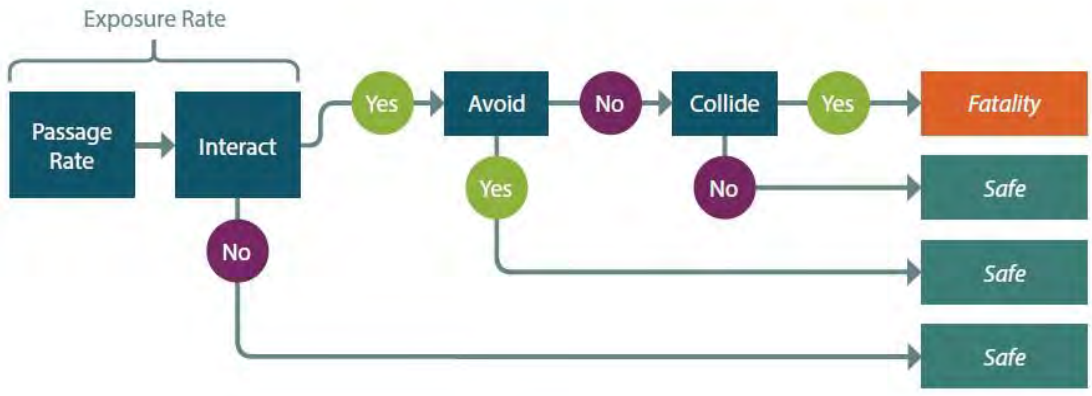

Figure C-1. Conceptual Marbled Murrelet Collision Model

The progression of events begins with defining the appropriate rate of exposure of a marbled murrelet to collision risk. As shown in Figure C-1, the exposure rate is equal to the number of murrelets expected to pass a WTG each year, defined as the passage rate (PR) multiplied by the chance of interacting with a WTG (P_I). To arrive at the predicted number of fatalities (F) per WTG each year, the exposure rate was multiplied by the probability of not avoiding the WTG (P_{NA}) and then the probability of colliding with the WTG (P_C). In this model, collision was

assumed to result in fatality; therefore, the words "collision" and "fatality" are used interchangeably. Mathematically, the annual fatality at a single WTG was calculated as follows:

$$F = PR \times P_I \times P_{NA} \times P_C$$

The major model parameters are presented in Table C-1. The values for each parameter were developed by combining site-specific information with literature values and Service recommendations. Notably, the model accounted for the following variability at each major step:

- **Passage Rate:** Passage rates were found to differ across WTGs at the Project site (Chambers Group and WEST 2019) based on Project-specific radar and visual survey data on marbled murrelet flights collected during the summers of 2013 and 2014. Therefore, the model used two different passage rates, with a higher rate assumed to occur at 10 of the WTGs and a lower rate at the remaining 28 WTGs. Of these 10 WTGs with higher passage rates, the five closest to murrelet nesting habitat had consistently high passage rates in both years of radar surveys, whereas the other five, at the opposite end of the turbine string, varied between the years.

  Passage rates were further adjusted to account for differences in murrelet flights at times other than those when the radar surveys were conducted. These adjustments considered flights at other times of day during the peak breeding season and in other seasons of the year. (In reality, the expected daytime and evening flights may be spread across the full breeding season from April 1 through September 23, but for simplicity they were assumed to be concentrated during the peak breeding season for the model, following the method of Nelson et al. 2003. This assumption does not affect model results for any of the alternatives analyzed here.) Seasonal adjustment factors are presented in Table 8 of the HCP. Passage rates were also adjusted by a factor of 1.5 to account for the fact that murrelets traveling in pairs may have been counted in the radar surveys as one bird.
- **Interaction:** The model also accounted for variation in the rate of interaction as influenced by the height and width of the WTG design specifications and the height at which a bird would encounter the WTG, using vertical flight data collected in the ABR, Inc., radar study (ABR, Inc. 2015). The WTG design assumed for the purposes of the model is a Vestas V136 with a 136-meter (446.2-foot) rotor diameter, an 82-meter (269-foot) tower, and a maximum rotational rate of 15 rotations per minute. This is consistent with the size of turbines anticipated in the Applicant's HCP.
- **Avoidance:** The model also considered how operational status of the WTG would influence avoidance behavior. A higher rate of avoidance was assumed for WTGs that were non-operational, with a lower rate assumed for those that were operating. In addition to periods of curtailment, periods of unsuitable wind conditions were also assumed to make turbines non-operational. Unsuitable wind conditions were defined as wind speeds less than 3 meters (9.8 feet) per second and greater than 25 meters (82 feet) per second, based on the cut-in and

cut-out speeds of the Vestas V136. Table 7 of the HCP presents the proportion of the time that wind conditions at the Project site were assumed to be suitable for WTG operation over the course of a year.

- **Collision:** The probability that a bird would collide with a WTG was based on the average air speed of murrelets (23.7 meters [77.8 feet] per second), average wind speed of 8.7 meters (28.5 feet) per second from wind data at the Project site, rotor diameter of 136 meters (446.2 feet), blade dimensions specified in Figure 9 of the HCP, and blade twist angles based on Thumthae (2015). Operational variation was also accounted for, with a higher collision rate applied to operational WTGs and a lower rate applied to non-operational WTGs. The model also assumed an average rate of collision for upwind and downwind flight patterns combined.

Table C-1. Major Marbled Murrelet Collision Model Parameters

Parameter	Description
Passage Rate, PR	Number of birds per day passing by an WTG. This value depends on seasonality and diurnal patterns of the species.
Probability of Interaction, P_I	The chance that a bird near a WTG would interact with it. This value depends on WTG dimensions and passage height and can be further broken down into horizontal interaction probability (HIP) and vertical interaction probability (VIP). P_I = HIP x VIP.
Probability of Non-Avoidance, P_{NA}	The chance that the bird flies straight toward the WTG, rather than avoiding it. This value depends on the innate flying ability of the species and the visibility and operational status of the WTG.
Probability of Collision, P_C	The chance that a bird unable to avoid a WTG would collide with it. This value depends on the geometry of the turbine, bird flight speed, wind speed, and turbine operational status.

Because no information is available from the few wind energy projects within the range of the marbled murrelet, there is significant uncertainty regarding how well marbled murrelets avoid wind turbines. Using best scientific judgement, two scenarios were used to estimate annual fatalities: a reasonable worst-case scenario with a high probability of non-avoidance, which provides a likely upper bound for annual fatality rates, and a scenario with non-avoidance rates more common among other bird species, which provides a lower fatality rate. Due to the uncertainty regarding murrelet rates of non-avoidance, the higher fatality estimates were used as the take estimates for the HCP and are reported here.

2 Eagle Collision Risk Model

2.1 Background

The Service uses explicit models in a Bayesian statistical framework to predict eagle fatalities at wind facilities while accounting for uncertainty. This model is hereafter referred to as the CRM. The analysis presented herein follows the Service's ECPG Version 2 (Service 2013); a more

detailed background on the Service's model and modelling framework are presented in Appendix D of the Technical Appendices of the ECPG.

The Service fatality prediction model is based on the assumption that there is a predictable relationship between pre-construction eagle exposure events (λ; eagle-minutes below 200m/hr·km^2) and subsequent annual fatalities resulting from collisions with wind turbines (F), such that:

$$F = \varepsilon\lambda C$$

where *C* is the probability of a collision given one minute of eagle flight within the hazardous area (see definition in the ECPG technical appendices), and ε is the expansion factor, a constant that describes the total area (or volume) and time within a project footprint that is potentially hazardous to eagles; this is used to expand λC, the number of birds killed per minute of exposure, into the annual number of predicted fatalities.

One advantage of using a Bayesian modelling framework is the ability to incorporate existing knowledge directly into the model by defining an appropriate prior probability distribution (hereafter "prior"). The Service has defined a prior distribution for eagle exposure (*Gamma* (0.97, 2.76)) based on the exposure rates across a range of projects under Service review and others described with sufficient detail in Whitfield (2009) and has defined a prior for collision probability (*Beta* (2.31, 396.69)) based on information from projects presented in Whitfield (2009). These prior distributions are updated with data collected from the wind facility under consideration to obtain posterior distributions (hereafter "posterior") that provide the project specific estimates of λ and *C*. Specifically, the exposure prior can be updated with pre-construction eagle use data collected at a site (note: when adequate pre-construction survey efforts are performed, the relative influence of the λ prior distribution on the resulting posterior λ becomes negligible). The collision probability prior can also be updated with post-construction fatality estimates if/when a project becomes operational. Details on these priors and how to update them can be found in the Service's ECPG (Service 2013).

Seasonal stratification of the model is possible when data was not collected representatively across seasons. To accomplish this stratification, daylight hours, eagle minutes, and survey effort must be known for each strata used. Since pre-construction survey effort at the proposed Skookumchuck site varied by season, four strata were identified for use when modelling predicted take. Table C-2 depicts those strata, their date ranges, and required data for each. All modelling attempts were completed using these strata.

Table C-2. Strata Used in Skookumchuck CRM and Needed Data for Each

Strata (Season)	Date Ranges	Bald Eagle Minutes (BEMins)	Golden Eagle Minutes (GEMins)	No. of Surveys	Daylight Hours[1]
SPRING	03/01 thru 05/31	63	13	92	1,250.4
SUMMER	06/01 thru 08/31	36	2	88	1,388.5
FALL	09/01 thru 11/30	25	18	74	992.5
WINTER	12/01 thru 02/28	50	25	67	836.2
	Totals	**174**	**58**	**321**	**4,467.6**

Note:
1. Daylight hours are defined as the hours between sunrise and sunset, totaled for each season/strata.

2.2 Calculating Model Variables

2.2.1 Exposure Rate Calculation (λ)

The exposure rate (λ) is defined in Appendix D of the Technical Appendices of the ECPG as the number of exposure events (eagle-minutes) per daylight hour per square kilometer. The exposure prior is defined in the ECPG as:

$$\text{Prior } \lambda \sim \textit{Gamma}\ (0.97, 2.76)$$

Site specific exposure rates can be used to update the exposure prior and determine a posterior distribution specific to a project area. The resulting posterior distribution (after updating the prior) is defined in the ECPG as:

$$\text{Posterior } \lambda \sim \textit{Gamma}\ \left(0.97 + \sum_{i=1}^{n} ki,\ 2.76 + \text{n}\right)$$

where *ki* is the summed number of eagle minutes and where *n* is the number of trials (equals hr*km2) that were conducted.

Collection of eagle-use information for the Project began in January 2016 and was completed in November 2017, prior to construction of the facility. Using Number of Surveys and Eagle Minutes from Table C-2, exposure posteriors for each strata/season and each species are calculated as follows.

2.2.1.1 Bald Eagle

Spring:

Posterior $\lambda \sim$ *Gamma* (0.97 + 63 BEMins, 2.76 + (92 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim$ *Gamma* (63.97, 187.7)

Summer:

Posterior $\lambda \sim$ *Gamma* (0.97 + 36 BEMins, 2.76 + (88 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim$ *Gamma* (36.97, 179.7)

Fall:

Posterior $\lambda \sim Gamma$ (0.97 + 25 BEMins, 2.76 + (74 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (25.97, 151.5)

Winter:

Posterior $\lambda \sim Gamma$ (0.97 + 50 BEMins, 2.76 + (67 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (50.97, 137.5)

2.2.1.2 Golden Eagle

Spring:

Posterior $\lambda \sim Gamma$ (0.97 + 13 GEMins, 2.76 + (92 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (13.97, 187.7)

Summer:

Posterior $\lambda \sim Gamma$ (0.97 + 2 GEMins, 2.76 + (88 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (2.97, 179.7)

Fall:

Posterior $\lambda \sim Gamma$ (0.97 + 18 GEMins, 2.76 + (74 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (18.97, 151.5)

Winter:

Posterior $\lambda \sim Gamma$ (0.97 + 25 GEMins, 2.76 + (67 counts x 1hr x π*(0.8km)^2))

Posterior $\lambda \sim Gamma$ (25.97, 137.5)

2.2.2 Collision Probability Calculation (C)

The probability of collision (*C*) is the probability of an eagle colliding with a turbine for each minute of exposure (eagle-minutes in the hazardous area). The collision probability prior distribution is defined in Appendix D of the Technical Appendices of the ECPG as:

Prior $C \sim Beta$ (2.31, 396.69)

Since the Project has not yet been constructed, there is not fatality data available with which to update the collision probability prior. As such, the collision probability prior was used in the CRM for both species. As post-construction fatality monitoring data becomes available, this collision probability prior can be updated for each species as described in the ECPG (Service 2013).

2.2.3 Expansion Factor Calculation (ε)

The expansion factor is defined as the product of the total hazardous area ($A = \pi \cdot r^2$, where r is the turbine rotor radius and A is summed across all turbines) and operational daylight hours per

turbine. The units for ε are hr·km^2. The number of daylight hours observed at the project by season/strata are listed in Table C-2.

Each alternative in this EIS analyzes impacts of a unique project design or operation plan. Thus, each alternative requires a unique ε be calculated and used in the CRM.

2.2.3.1 No Action Alternative

The No Action Alternative analyzes impacts of a constructed project that is not operational. Since operational daylight hours = zero for all calculations of ε, this results in an ε equal to zero in all seasons.

All Seasons:

$$\boldsymbol{\varepsilon} = 0\text{hr} \times (\pi(0.068\text{km})^2) \times 38 = \mathbf{0\ hr{\cdot}km^2}$$

Recalling the equation that governs the CRM ($F = \varepsilon\lambda C$), because ε equals zero, predicted fatalities will equal zero under this alternative for both bald and golden eagles.

2.2.3.2 Alternative 1

Alternative 1 analyzes impacts of a fully operational 38 turbine project, where it is assumed turbines will operate during all daylight hours (even though it is understood that this may not be the case due to varying wind speeds and possible IdentiFlight curtailment). The following expansion factors for each season/strata, are used in Alternative 1 for both bald and golden eagles.

Spring:

$$\boldsymbol{\varepsilon} = 1250.4\text{hr} \times (\pi(0.068\text{km})^2) \times 38 = \mathbf{690.2\ hr{\cdot}km^2}$$

Summer:

$$\boldsymbol{\varepsilon} = 1388.5\text{hr} \times (\pi(0.068\text{km})^2) \times 38 = \mathbf{766.5\ hr{\cdot}km^2}$$

Fall:

$$\boldsymbol{\varepsilon} = 992.5\text{hr} \times (\pi(0.068\text{km})^2) \times 38 = \mathbf{547.9\ hr{\cdot}km^2}$$

Winter:

$$\boldsymbol{\varepsilon} = 836.2\text{hr} \times (\pi(0.068\text{km})^2) \times 38 = \mathbf{461.6\ hr{\cdot}km^2}$$

2.2.3.3 Alternative 2

Alternative 2 analyzes impacts of a partially operational 38 turbine project, where 5 turbines are constructed but not operated. Assuming, as the CRM does, that turbines that do not spin do not put eagles at measurable risk, this project design is the equivalent of a 33-turbine project, where it is assumed that 33 turbines will operate during all daylight hours (even though it is understood that this may not be the case due to varying wind speeds and possible IdentiFlight curtailment).

The following expansion factors for each season/strata, are used in Alternative 2 for both bald and golden eagles.

Spring:

ε = 1250.4hr x (π(0.068km)^2) x 33 = **599.4 hr·km^2**

Summer:

ε = 1388.5hr x (π(0.068km)^2) x 33 = **665.6 hr·km^2**

Fall:

ε = 992.5hr x (π(0.068km)^2) x 33 = **475.8 hr·km^2**

Winter:

ε = 836.2hr x (π(0.068km)^2) x 33 = **400.9 hr·km^2**

2.2.3.4 Alternative 3

Alternative 3 analyzes impacts of a partially operational 38 turbine project, where all turbines are curtailed for 2 hours after sunrise, and for 2 hours before sunset each day from April 1 through September 30. This equates to 4 fewer operational daylight hours per turbine per day during the aforementioned date range. For the remainder of the year (from October 1 through March 31), all 38 turbines would be fully operational. Considering this operational plan, the daylight hours per season/strata are listed in Table C-3, and the following expansion factors for each season/strata are used in Alternative 3 for both bald and golden eagles.

Table C-3. Calculation of Operational Daylight Hours per Season/Strata After Curtailment Is Implemented Under Alternative 3

Strata (Season)	Date Ranges	Daylight Hours	No. of Days with Curtailment	Hours of Curtailment per Turbine	Daylight Hours After Curtailment
SPRING	03/01 thru 05/31	1,250.4	61	244	1,006.4
SUMMER	06/01 thru 08/31	1,388.5	92	368	1,020.5
FALL	09/01 thru 11/30	992.5	30	120	872.5
WINTER	12/01 thru 02/28	836.2	0	0	836.2
	Totals	**4,467.6**	**183**	**732**	**3,735.6**

Spring:

ε = 1006.4hr x (π(0.068km)^2) x 38 = **555.5 hr·km^2**

Summer:

ε = 1020.5hr x (π(0.068km)^2) x 38 = **563.3 hr·km^2**

Fall:

ε = 872.5hr x (π(0.068km)^2) x 38 = **481.6 hr·km^2**

Winter:

ε = 836.2hr x (π(0.068km)^2) x 38 = **461.6 hr·km^2**

2.3 Bayesian Model Inputs and Calculations

The tables that follow summarize the model inputs for each species and each alternative. Note that no inputs are presented for the No Action Alternative, since the expansion factor (ε) and thus the fatality prediction for both species under that Alternative equals zero.

2.3.1 Alternative 1

Table C-4. Summary of CRM Inputs for Predicting Bald Eagle Fatalities Under Alternative 1

Bald Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	38				
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	63	36	25	50	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1250.4	1388.5	992.5	836.2	Assuming operation during all DL hrs

Table C-5. Summary of CRM Inputs for Predicting Golden Eagle Fatalities Under Alternative 1

Golden Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	38				
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	13	2	18	25	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1250.4	1388.5	992.5	836.2	Assuming operation during all DL hrs

2.3.2 Alternative 2

Table C-6. Summary of CRM Inputs for Predicting Bald Eagle Fatalities Under Alternative 2

Bald Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	33				38 turbines built, 5 not operating
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	63	36	25	50	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1250.4	1388.5	992.5	836.2	Assuming operation during all DL hrs

Table C-7. Summary of CRM Inputs for Predicting Golden Eagle Fatalities Under Alternative 2

Golden Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	33				38 turbines built, 5 not operating
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	13	2	18	25	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1250.4	1388.5	992.5	836.2	Assuming operation during all DL hrs

2.3.3 Alternative 3

Table C-8. Summary of CRM Inputs for Predicting Bald Eagle Fatalities Under Alternative 3

Bald Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	38				
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	63	36	25	50	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1006.4	1020.5	872.5	836.2	Curtail 4 hrs per day; See Alt 3 ε calc.

Table C-9. Summary of CRM Inputs for Predicting Golden Eagle Fatalities Under Alternative 3

Golden Eagle	Spring Inputs	Summer Inputs	Fall Inputs	Winter Inputs	Notes
# of Turbines	38				
Rotor Swept Radius (km)	0.068				68m radius
Count Duration (hrs)	1				60 minutes
Number of Counts	92	88	74	67	Variable effort by season
Eagle Minutes	13	2	18	25	
Survey Area/Count (km^2)	2.01				Circle with 800m radius
Operational Daylight Hrs (hrs)	1006.4	1020.5	872.5	836.2	Curtail 4 hrs per day; See Alt 3 ε calc.

2.4 Running the Bayesian Model

As described in Appendix D of the Technical Appendices of the ECPG, the Service's Bayesian model calculates predicted fatalities using Gibbs sampling. As a result, the mathematical form of the posterior distribution is known because the distributions specified for the data and the prior are in the same family (known as conjugacy). To make inference on the parameters of interest (exposure and collision in this case), values are drawn from the mathematical representation of the exposure posteriors described above and the collision probability prior (n = 100,000 for Skookumchuck) in order to obtain the posterior distribution of predicted fatalities. Distributions of predicted fatalities for each species and season/strata at the Project facility and for each Alternative analyzed in this EIS are depicted in the following figures. Model results for each species and Alternative, including the mean, standard deviation (SD), median (Q50), and 80th, 90th, and 95th quantiles (Q80, Q90, and Q95, respectively) are depicted in Table C-10. Note that no distributions or results are presented for the No Action Alternative, since the expansion factor (ε) and thus the fatality prediction for both species under that Alternative equals zero.

2.4.1 Alternative 1

2.4.1.1 Bald Eagles

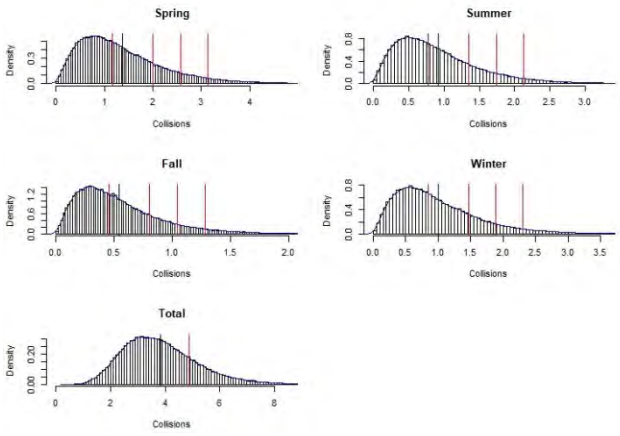

Figure C-2. Predicted Bald Eagle Fatalities Under Alternative 1

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions

2.4.1.2 Golden Eagles

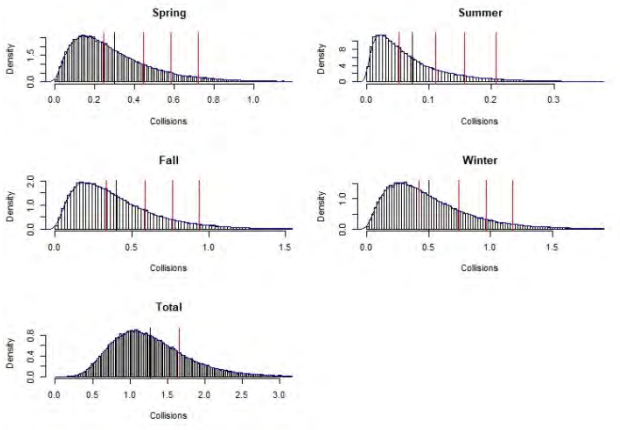

Figure C-3. Predicted Golden Eagle Fatalities Under Alternative 1

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions

2.4.2 Alternative 2

2.4.2.1 Bald Eagles

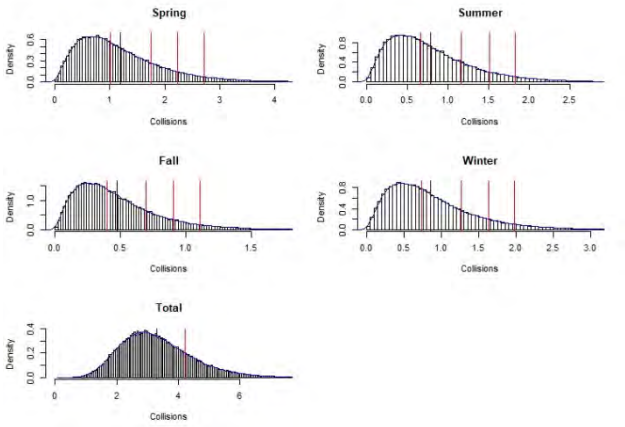

Figure C-4. Predicted Bald Eagle Fatalities Under Alternative 2

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions.

2.4.2.2 Golden Eagles

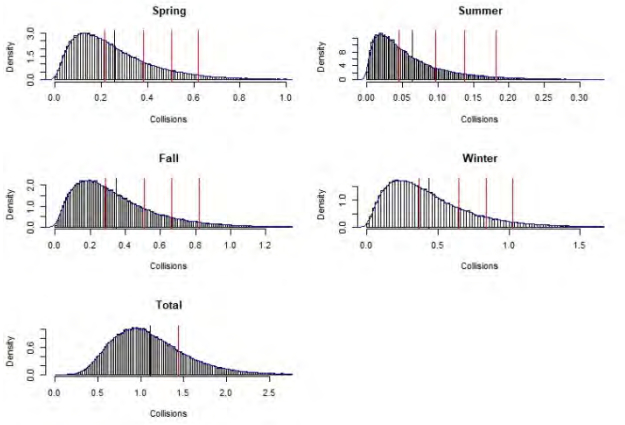

Figure C-5. Predicted Golden Eagle Fatalities Under Alternative 2

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions.

2.4.3 Alternative 3

2.4.3.1 Bald Eagles

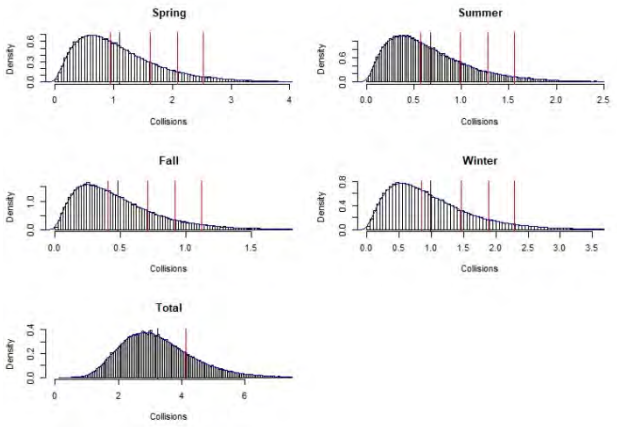

Figure C-6. Predicted Bald Eagle Fatalities Under Alternative 3

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions.

2.4.3.2 Golden Eagles

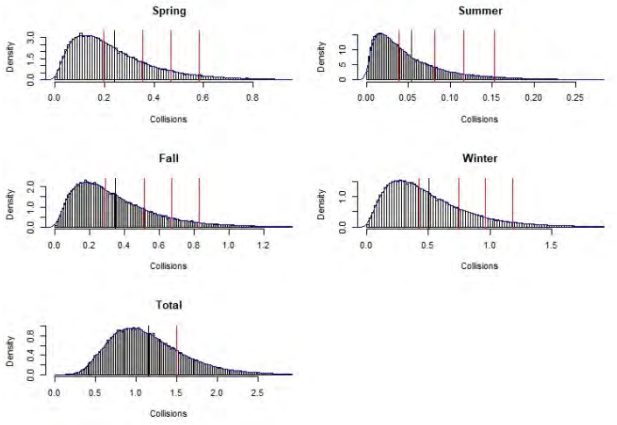

Figure C-7. Predicted Golden Eagle Fatalities Under Alternative 3

The vertical black line in each graph depicts the mean annual fatality prediction. In seasonal distributions, the red vertical lines represent the 50th, 80th, 90th, and 95th quantiles (from left to right) for each strata. In the "Total" distributions, the single red line represents the 80th quantile, which is the quantile the Service uses as a prediction of eagle collisions.

Table C-10 is a summary of model outputs (take predictions in eagles per year) for each species by Alternative and season/strata, including the total annual prediction. Outputs include the mean, standard deviation (SD), median (Q50), 80th quantile (Q80), 90th quantile (Q90), and 95th quantile (Q95). Colored outputs are predictions at the 80th quantile, reflecting the Service's policy to conservatively predict fatalities when authorizing eagle take. Numbers in yellow are those predictions for the Preferred Alternative. Should that Alternative be chosen, yellow numbers would be the number of fatalities authorized for each species of eagle, rounded up to the nearest whole number.

Table C-10. Fatality Predictions by Season and Quantile for Each Species and Alternative

	Bald Eagles						Golden Eagles					
	Mean	**SD**	**Q50**	**Q80**	**Q90**	**Q95**	**Mean**	**SD**	**Q50**	**Q80**	**Q90**	**Q95**
Alternative 1												
Spring	1.36	0.92	1.16	2.00	2.58	3.14	0.30	0.22	0.24	0.44	0.58	0.72
Summer	0.92	0.63	0.77	1.35	1.74	2.13	0.07	0.07	0.05	0.11	0.16	0.21
Fall	0.54	0.38	0.46	0.81	1.04	1.27	0.40	0.28	0.33	0.58	0.76	0.94
Winter	0.99	0.67	0.84	1.46	1.88	2.28	0.51	0.35	0.43	0.75	0.97	1.18
TOTAL	3.81	1.35	3.63	4.86	5.61	6.29	1.27	0.50	1.20	1.65	1.94	2.21
Alternative 2												
Spring	1.19	0.80	1.01	1.75	2.24	2.72	0.26	0.19	0.21	0.38	0.50	0.62
Summer	0.79	0.54	0.67	1.17	1.51	1.84	0.06	0.06	0.05	0.10	0.14	0.18
Fall	0.47	0.33	0.40	0.70	0.90	1.10	0.34	0.24	0.29	0.51	0.66	0.81
Winter	0.86	0.58	0.73	1.27	1.64	1.98	0.44	0.30	0.37	0.65	0.84	1.02
TOTAL	3.31	1.17	3.16	4.22	4.88	5.47	1.10	0.44	1.04	1.43	1.68	1.92
Alternative 3												
Spring	1.10	0.73	0.94	1.61	2.08	2.52	0.24	0.17	0.20	0.35	0.46	0.58
Summer	0.67	0.46	0.57	0.99	1.28	1.55	0.05	0.05	0.04	0.08	0.12	0.15
Fall	0.48	0.34	0.40	0.71	0.92	1.13	0.35	0.25	0.29	0.51	0.67	0.83
Winter	0.99	0.67	0.84	1.46	1.88	2.28	0.50	0.35	0.42	0.74	0.97	1.18
TOTAL	3.23	1.14	3.08	4.12	4.75	5.32	1.15	0.47	1.07	1.50	1.77	2.02

3 Conclusion

Annual fatality predictions calculated here will be used to calculate the amount of eagle take to be authorized over the tenure of a 30-year Section 10 ITP. The modelling described above predicts, at the 80th quantile of the Preferred Alternative, that 4.86 bald eagles and 1.65 golden eagles will be killed annually at the Project. Over thirty years, that equates to 145.8 bald eagles and 49.5 golden eagles. If an eagle take authorization is given for this project, the Service would

round these numbers up to the nearest whole number and authorize the incidental take of 146 bald eagles and 50 golden eagles over the 30-year permit term.