APPENDIX K

Biological Resources: *Humboldt Wind Energy Project Marbled Murrelet Habitat Assessment and Auditory and Visual Disturbance Analysis Report, Humboldt County, California, Summer and Fall 2018*

Humboldt Wind Energy Project

Marbled Murrelet Habitat Assessment and Auditory and Visual Disturbance Analysis Report

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Acronyms and Abbreviations

ac	acre
cm	centimeter
CNDDB	California Natural Diversity Database
DBH	diameter at breast height
FESA	federal Endangered Species Act
ft	foot/feet
gen-tie	generation transmission line
ha	hectare
HRC	Humboldt Redwood Company
HRSP	Humboldt Redwoods State Park
km	kilometer
m	Meter
mi	Mile
USFWS	U.S. Fish and Wildlife Service

Note:

Often, agency suggestions and guidelines are provided in US units of measure (e.g., acre [ac] feet [ft], or miles [mi]), and in other instances, agency guidance is provided in metric (aka SI, or System International) units (e.g., meters [m] or kilometers [km]). To convert an otherwise readily recognized agency standard (e.g., 10 mi or 1 km) to the other system may result in confusion. Accordingly, we provide measures in either system, using the original agency suggestion unchanged, and provide conversion to the other standard only when it makes sense to do so.

Executive Summary

Humboldt Wind, LLC, plans to permit, build, and operate a wind energy project in Humboldt County, California. As one part of the studies to support review of the project pursuant to state and federal regulations, Stantec Consulting Services Inc. conducted a habitat assessment for nesting marbled murrelets (*Brachyramphus marmoratus*). We reviewed forested stands within 0.25 mile of the project area per the *Methods for Surveying Marbled Murrelet in Forests: A Revised Protocol for Land Management and Research* (Evans Mack et al. 2003). Aerial images were evaluated, and site visits and interviews with landowner foresters were conducted to determine which stands might contain potential nesting habitat. Because of small stand size, tree size, and age since last timber harvest, we conclude that none of the stands on the two ridges where wind turbines are proposed have potential habitat for nesting murrelets. However, one stand adjacent to the generation transmission line, and two stands across Highway 101 from the planned operations and maintenance facility have the potential support nesting murrelets. Additionally, two recently fragmented coniferous forest stands located near the planned operations and maintenance facility may provide low quality nesting habitat for murrelets. Auditory harassment could occur at five potential habitat sites if construction activities take place during the breeding season and murrelets are occupying these habitats

1.0 INTRODUCTION

Humboldt Wind, LLC (Humboldt Wind) is planning to construct and operate the Humboldt Wind Energy Project (project) in south-central Humboldt County, California (Figure 1). The project would consist of up to 60 wind turbines and associated facilities including meteorological towers, electrical collection system, access roads, construction staging areas, a substation, an operations and maintenance facility, up to a 25-mile (mi) generation transmission line (gen-tie) and its point of interconnection at the existing Pacific Gas & Electric Bridgeville Substation. The project would have a potential generating capacity of up to 155 megawatts. Proposed turbine locations are situated on two prominent ridgelines, Bear River Ridge and Monument Ridge, 4.7 mi south and southwest of Scotia, in Humboldt County, California (Figure 1).

The project area encompasses areas of potential activity and includes a 1,000-foot-(ft-) wide corridor centered on proposed turbine locations; a 200-ft-wide corridor centered on project roads, the electrical collection line, and the gen-tie; and a 500-ft-wide buffer around proposed staging and temporary impact areas and project substations, encompassing up to 2,241 acres (ac) (Figure 2). The project area is divided into the following segments for descriptive purposes:

- Bear River Ridge
- Western Monument Ridge
- Eastern Monument Ridge
- Monument Ridge – Highway 101
- Highway 101 – Shively Ridge
- Shively Ridge
- Bridgeville

Stantec Consulting Services Inc. (Stantec) prepared a Draft Biological Resources Work Plan (Draft Work Plan) detailing biological resource surveys designed to support project planning (Stantec 2018). Included in the Draft Work Plan is a habitat assessment for marbled murrelet (*Brachyramphus marmoratus*).

The marbled murrelet, hereafter also referred to as “murrelet,” is listed under the federal Endangered Species Act (FESA) as threatened and California Endangered Species Act as endangered. The species is also protected under the Migratory Bird Treaty Act of 1918 as amended and California Fish and Game Code Section 3513 (Taking Migratory Bird Treaty Act Birds). The project occurs within the current range of the murrelet and the species is known to occur in the region.

In August 2018, Stantec conducted a marbled murrelet habitat assessment followed by an auditory and visual disturbance analysis. The study area included the project area and a 0.25-mi radius around the project area per the Pacific Seabird Group Marbled Murrelet Technical Committee’s Methods for Surveying Marbled Murrelets in Forests: A Revised Protocol for Land Management and Research (Evans Mack et al. 2003) and as outlined in the U.S. Fish and Wildlife Service’s (USFWS) Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California (USFWS 2006). The study area encompasses approximately 16,139 ac (Figure 3).

This report was prepared to support FESA and the California Endangered Species Act regulatory agency consultation and the California Environmental Quality Act review process by: 1) identifying and characterizing potential marbled murrelet nesting habitat in the study area; 2) evaluating the quality of identified murrelet nesting habitat and discussing potential use of the habitat during the lifespan of the project; 3) discussing potential impacts on identified murrelet nesting habitat during all project phases including decommissioning; and 4) providing an auditory and visual disturbance analysis.

This marbled murrelet habitat assessment describes the environmental setting and murrelet life history, summarizes the habitat assessment and disturbance analysis methods and results, and discusses potential impacts on marbled murrelet that may occur from project implementation.

2.0 ENVIRONMENTAL SETTING

Humboldt County is within the Klamath/North Coast bioregion and features a rocky coastline, montane forests, and small and sparsely populated settlements. Cool, moist climate is typical on the coast but becomes progressively drier, warmer, and more variable but remaining mild inland. Humboldt County features several biological communities; the most abundant is coniferous forest comprised of Douglas-fir (*Pseudotsuga menziesii*), redwood (*Sequoia sempervirens*), and pine (*Pinus* spp.) forests, followed by oak (*Quercus* spp.) woodlands and grasslands. Less abundant habitats include coastal beach dune vegetation, northern coastal scrub, chaparral, salt marsh, riparian, and freshwater marsh. Humboldt Bay, located about 16 mi north of the project, is the second largest estuary in California. As such, the Humboldt Bay and Humboldt County coasts support many species of resident and migratory wildlife with high seasonal and year-round abundance. Six rivers run through the county, providing habitats for fish and wildlife as well as important water resources.

Humboldt County spans two geologic provinces. The Coast Ranges Province in the county's center and southwest is comprise mainly Franciscan Complex, with schists, sand, and other alluvial deposits associated with the coast. The Klamath Mountains Province in the northeast features older sedimentary rock including sandstone, chert, slate, and schist.

The average July temperature in Humboldt County is typically in the 60s (Fahrenheit). While rain can occur throughout the year, about 90% of the annual rain results from Pacific Ocean storms and falls between October and April. Seasonal totals average more than 40 inches (in.) in the driest areas and exceed 100 in. in the wettest zones. Moisture and moderate temperature combined create high average relative humidity.

The project is on privately owned and managed lands in rural, unincorporated south-central Humboldt County, 10 mi southeast of Ferndale, 20 mi south of Eureka, and 22 mi north of Garberville, California. Most of the project would be located on two prominent ridgelines that are located south and east of the town of Scotia. Monument Ridge and Bear River Ridge are located south and west of Highway 101 and the Eel River, and Shively Ridge is located north and east of Highway 101 and the Eel River.

The project area consists primarily of managed timberlands that are dominated by redwood and Douglas-fir forests, with annual grassland, hardwood, and chaparral inclusions. In addition to timber production, some areas of the

project site are managed for cattle grazing. The topography is diverse and steep in places, and elevation ranges from nearly sea level in river bottoms to just over 3,000 feet (ft).

The general plan designation for the majority of this area is Timber, with a smaller amount of Agricultural Grazing. About 100 ac of the project area has a designation of Residential Agriculture. Most of the area is zoned Timber Production Zone (TPZ) and Agriculture Exclusive (AE) with a combining zone specifying a minimum building site of 160 ac (AE-B-5(160)).

3.0 NATURAL HISTORY OF MARBLED MURRELET

The marbled murrelet is a small seabird that exists along the Pacific Coast of western North America, ranging from central California to northern Alaska (Carter and Erikson 1992, Piatt and Naslund 1995). Due to population declines primarily associated with habitat loss in California, Oregon, and Washington, in 1992 this species was listed as federally Threatened (Federal Register 57 FR 45328) and listed as Endangered in California (USFWS 1997). Like other members of the family Alcidae, murrelets are long-lived; the oldest individual known was at least 21 years old (R. Golightly, personal observation). Murrelets also have a slow reproductive cycle; they require 2 to 3 years to reach sexual maturity (Peery and Henry 2010), and do not nest every year (Hébert and Golightly 2006). They lay a single egg on the branch of an old tree as far as 88 kilometers (km) inland from the coast (Raphael et al. 2016). Nesting pairs are thought to persist through time, often reusing the same nest or nest stand year after year (Golightly and Schneider 2011, Plissner et al. 2015). Low fecundity that is typical of Alcids results in slow population growth with the population's capacity for growth most reliant upon adult survival (Sæther and Bakke 2000, Peery and Henry 2010).

Murrelets spend much of their life at sea. They forage in the near-shore waters for small fish and invertebrates (Burkett 1995, Golightly et al. 2004, Peery and Golightly in prep). While nesting, marbled murrelets forage at-sea and remain close to nests, traveling an average of 1.4 km off-shore and as far as 99.1 km along-shore in northern California (Hébert and Golightly 2008). Although murrelet movements are not well studied outside of the breeding period, there is no evidence that they seasonally migrate away from breeding areas (McShane et al. 2004); however, they may have a considerably larger home range on the ocean when they are not nesting and are able to travel farther (Hébert and Golightly 2008, Bertram et al. 2015, Lorenz et al. 2017).

Like all seabirds, murrelets must return to land to nest. However, in contrast to most seabirds which nest on offshore rocks and islands, marbled murrelets typically nest high above ground on large branches of old-growth and late-successional coniferous trees. In British Columbia and northward, there are exceptions to tree nesting where murrelet nests have also been rarely found on the ground in forested and non-forested areas (Simons 1980, Mendenhall 1992, Bradley and Cooke 2001) but ground nesting, with the exception of one cliff nest found in Washington, has never been documented south of British Columbia despite extensive study (Hamer and Nelson 1995, Peery et al. 2004, Hébert and Golightly 2006).

Few murrelet nests have been found due to the difficulty of accessing the canopy of old-growth forests and because of the cryptic behaviors exhibited by murrelets in and around their nest (Nelson and Hamer 1995a, Golightly and Schneider 2009); despite extensive searching, the first murrelet nest was discovered only accidentally in 1974 in Central California (Binford et al. 1975) and, as of 2002, only about 300 nests had been found in the entire species' range (Evans Mack et al. 2003). Murrelets do not build nest structures, but instead, they lay and incubate their eggs

on large, flat tree branches with natural depressions or moss, lichen, and tree litter. In California, the most common species used for nesting is redwood (Golightly et al. 2009), but murrelets are also reported to use Douglas-fir (Baker et al. 2006) and other large conifers (Oregon Department of Fish and Wildlife 2018). In northern California, redwoods are the most common conifer available for nesting and branches used for nesting averaged 29.2 centimeters (cm) in diameter at the location of the nest (Golightly et al. 2009). Generally, only very large, older trees contain such platforms, and thus, murrelets are "closely associated with old-growth and mature forests for nesting" (Nelson and Wilson 2002, Evans Mack et al. 2003) and diameter at breast height (DBH) of nest trees in northern California averaged 266 cm (104.7 in; Golightly et al. 2009). Murrelets only reliably nest in contiguous stands of mature and old-growth forest that exceed 0.5 km^2 (124 ac; Meyer et al. 2002, Meyer et al. 2007). Large unfragmented areas of forest minimize detrimental effects of hard edges such as increased predator densities (Nelson and Hamer 1995b, Marzluff and Restani 1999, Malt and Lank 2009, Gabriel and Golightly 2014) and altered microclimate (McShane et al. 2004, van Rooyen et al. 2011).

Murrelets transit between foraging areas at sea and inland nesting locations throughout the year, but most inland flights occur during the breeding season as murrelets incubate their egg and, upon hatching, feed their young (Naslund 1993, Hébert and Golightly 2006, Sanzenbacher et al. 2014). In Oregon and northern California, egg laying generally begins between mid-April and June, depending on variation in ocean conditions. Incubation lasts for 28 to 30 days with each parent alternating 24-hour shifts sitting on the egg until the chick hatches. During incubation, each nesting murrelet makes a single transit between land and sea each morning around sunrise (45 minutes prior to and 75 minutes following sunrise) (Evans Mack et al. 2003). Chicks hatch between late May and July. The chick is fed by the parents for another approximately 28 days until it fledges and flies to the ocean. After chicks hatch, murrelets continue to make this early morning transit each day to deliver a fish to their chick and they often embark on an additional flight to feed chicks in the evening around sunset (with the average flight occurring 23 minutes before sunset) (Hébert and Golightly 2006). Outside of the breeding period, murrelets will periodically travel inland at dawn (Naslund 1993, Sanzenbacher et al. 2014) for unknown reasons that may include maintaining pair bonds, examining future nesting areas, or engaging in other social activities (Carter and Sealy 1986, Carter and Erickson 1992, Naslund 1993). Throughout the year, murrelets restrict transits between the ocean and inland nesting habitat to times of limited lighting—sunrise and sunset—to minimize discovery of an egg or chick by predators and minimize risk of predation of the flying adult by raptors or other birds of prey (Nelson 1997, Hébert and Golightly 2006). At sunrise, breeding birds may be accompanied by additional non-breeders that may be seeking nesting opportunities or socializing (Naslund 1993, Hébert and Golightly 2006).

To reach an inland nest, murrelets must be good flyers. However, they must also successfully capture small fish and invertebrates underwater and to do so requires that they are adept at swimming. Their body form is a compromise that allows them to fly efficiently through both the air and water; specifically, murrelets have wings that are small relative to their mass (217 grams) (Hébert and Golightly 2006). When transiting between foraging and nesting habitats, murrelets can attain cruising speeds that average 50 mi per hour (81 km per hour) and have been documented flying as fast as 95 mi per hour (154 km per hour) (Nelson 1997, Elliott et al. 2004).

Coastal old-growth forests suitable for murrelet nesting were formerly much larger and more contiguous. However, range-wide timber harvests of coastal old-growth forests in the last 150 years has reduced habitat suitable for murrelet nesting to only a small fraction of the original forest (less than 4% in CA) (Carter and Ericson 1992). In California, most remaining forests that are suitable for nesting murrelets are presently protected as reserves and parks (Carter and Ericson 1992). Although habitat loss has halted in California reserves and parks, populations still

suffer from frequent predation of nests by corvid species that are attracted by food made available by humans in campgrounds located in these protected old-growth forests (Marzluff and Neatherlin 2006, USFWS 2009, Recovery Implementation Team 2012, Goldenberg et al. 2016).

4.0 METHODS

Stantec conducted a habitat assessment for marbled murrelet following the general procedure described in *Methods for Surveying Marbled Murrelet in Forests: A Revised Protocol for Land Management and Research* (hereinafter, "protocol") (Evans Mack et al. 2003). Stantec also performed an auditory and visual disturbance assessment following the guidelines provided in *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (hereinafter, "USFWS guidance") (USFWS 2006). The study area included the project area and a 0.25-mi radius around the project area as specified in the protocol and USFWS guidance. The study area encompasses approximately 16,139 ac (Figure 3).

The Eel River is a known flyway for murrelets transiting from the ocean to potential nesting habitats in Humboldt Redwoods State Park (HRSP) or other forests south and along the river. To avoid any potential for collision with power lines associated with the project crossing the river, the proposed gen-tie will cross the river by using one of three options: 1) lines will be placed under the river; 2) lines will be placed on an existing structure that already crosses the river (e.g., Stafford Bridge), or; 3) lines will be typical overhead lines but will be placed in the "shadow" of Stafford Bridge, where distribution lines are already present. Consequently, this analysis does not consider risk to the Eel River flyway.

4.1 MARBLED MURRELET HABITAT ASSESSMENT

The habitat assessment includes a database and background literature review, a desktop-level assessment to identify potential marbled murrelet nesting habitat in the study area, and on-the-ground evaluations to identify and assess potential nesting habitat. Data collected during on-the-ground evaluations was used to analyze the extent and quality of potential marbled murrelet nesting habitat in the study area.

4.1.1 Database and Literature Review; Desktop-Level Assessment

Stantec reviewed the following databases and literature: 1) Humboldt Redwood Company, LLC's (HRC) existing murrelet habitat and old-growth maps, and timber harvest data; 2) California Department of Fish and Wildlife Biogeographical Information and Observation System California Natural Diversity Database (CNDDB) marbled murrelet occurrence records for the study area and vicinity (CDFW 2018); 3) USFWS online Critical Habitat Portal to determine whether designated critical habitat for marbled murrelet occurs in the study area; and 4) scientific literature on characteristics of murrelet habitat. Additionally, we interviewed the professional foresters (Western Timber Services) for the Russ Ranch and Timber Company, LLC (for the project area located on Bear River Ridge) and HRC (for the project area located on Monument Ridge, Shively Ridge, and along the gen-tie) to discuss stand ages and timber harvest history across the study area (Figure 2).

Following review of background information, a desktop-level assessment was performed for potential murrelet nesting habitat in the study area and habitat spatial data was prepared using ESRI ArcGIS/Arcinfo. The spatial data was developed through interpretation of ESRI aerial imagery of the study area and vicinity and relied in part on HRC's existing marbled murrelet habitat and forest stand maps and California Department of Fish and Wildlife's CNDDB occurrence records for marbled murrelet. The desktop-level assessment primarily focused on identifying mature or older closed canopy coniferous forest stands or groups of trees in the study area. In some cases, forest stands identified in the study area also extended outside the study area. Where this occurred, the portion of the stand outside the study area was also mapped to provide a thorough evaluation of the entire stand and not just an evaluation of the portion of the stand within the study area; this expansion of the area evaluated was done to ensure that the risk assessment based on stand size considered the true extent of the stand and to identify any potential to attract murrelets to cross any segment of the study area. One hundred coniferous forest stands, or groups of trees, were identified during the desktop-level assessment and were evaluated for potential to support marbled murrelet nesting (Appendix A). Due to the sensitive nature of showing locations of these stands, and in consideration of revealing specifics of private lands (especially as we extended the analysis beyond the project area), no figures are included in this report depicting the specific locations of these stands. Rather, the location of each stand is referenced to one of the seven project area segments and project components shown in Figure 2 (Appendix A).

4.1.2 On-The-Ground Evaluation

On-the-ground evaluations were conducted between August 13 and 31, 2018, to assess potential murrelet habitat within the forest stands identified in Appendix A. Follow-up field visits were conducted on October 25 and November 3, 2018 to further scrutinize stands where the combination of attributes suggested a likelihood of potential nesting habitat. Field maps were prepared using ESRI aerial satellite imagery taken between June 27, 2016 and June 14, 2017 as the base layer overlaid with the habitat spatial data developed during the desktop-level assessment. The field maps ranged in scale from 1:500 to 1:2000 depending on quality of imagery available and landscape complexity.

Stantec followed the guidelines provided in the protocol to evaluate potential murrelet nesting habitat in the study area. Per the protocol, murrelet habitat is broadly defined as mature or old-growth coniferous forests, or younger coniferous forests with platforms. Platforms are characterized as greater than 4 in. in diameter and relatively flat and at least 33 ft up in the live crown of a coniferous tree. Platforms may include but are not limited to branches; moss, lichen, or duff covered branches; mistletoe or witch's brooms; tree deformities; and squirrel nests. The field effort included evaluating coniferous forest stands or groups of trees and individual trees.

Data collected during on-the-ground evaluations included:

- Location and extent of habitat
- Topographic position of habitat on slope based on the following five categories: 1) Canyon bottom; 2) Lower 1/3 of slope; 3) Middle 1/3 of slope; 4) upper 1/3 of slope, or; 5) Ridgetop
- Percent canopy cover based on the following four categories: 1) 0–25%; 2) 26–50%; 3) 51–75%, or; 4) 76–100%
- Dominant and co-dominant tree species present
- DBH of largest tree
- Average DBH per forest stand
- Understory characteristics including dominant/co-dominant plant species

- Aspect and percent slope
- Platform(s) present including type and general description of the platform(s)

On-the-ground evaluations were conducted throughout the study area and included a subset of coniferous forest stands with the goal of gaining a representation of stands within each project segment. On exception is the stands mapped along the Bear River Ridge segment, which were not accessible due to property owner restrictions. In this segment, the landowner forester was interviewed to obtain stand characteristics. We evaluated 39 of 100 coniferous forest stands that were identified during the desktop-level assessment. These 39 stands were primarily located within or adjacent to the project area. In many instances, additional stands that were not evaluated on-the-ground were assessed from vantage points (e.g., ridgetops, clearings) that provided an unobstructed view of the stand.

During on-the-ground evaluations, we observed twenty-nine mature or residual coniferous trees with suitable branch platforms. These trees are evaluated below in Section 5.1.2.

4.1.3 Evaluation of Marbled Murrelet Nesting Habitat

Stantec used existing information on marbled murrelet habitat characteristics provided in scientific literature; the data collected during on-the-ground evaluations; and ESRI ArcGIS/Arcinfo analytical tools to assess habitat quality and potential marbled murrelet use of the habitat for nesting. Parameters used to evaluate forest stands or groups of trees included:

- Stand size
- Stand perimeter length
- Stand position on slope
- DBH of largest coniferous tree in stand
- Average DBH of stand
- Platform type(s) and characteristics
- Historical and recent timber management activities and forest landscape changes
- CNDDB occurrence records for marbled murrelet
- Stand age as described by the appropriate land manager/forester

Individual or residual trees were evaluated for potential to support marbled murrelet nesting based on position on slope, proximity to frequent disturbance (e.g., roads), surrounding forest structure, and proximity to recent or historical timber harvest units.

4.2 Auditory and Visual Disturbance Analysis

The auditory and visual disturbance analysis was conducted following USFWS guidance (USFWS 2006) and considered murrelet crepuscular flights into and out of nest stands. Marbled murrelet is listed as threatened under the FESA and the FESA prohibits acts of disturbance that result in the “take” of a threatened or endangered species. The definition of “take” includes to “harass” which is defined as an intentional or negligent act or omissions which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns

which include, but are not limited to, breeding, feeding, or sheltering. The USFWS guidance provides examples which include:

- Flushing an adult or juvenile from an active nest during the reproductive period
- Precluding adult feeding of the young for a daily feeding cycle
- Precluding feeding attempts of the young during part of multiple feeding cycles

Scenarios are identified in the USFWS guidance that describe a variety of ambient and project noise conditions. These scenarios include reasonable estimates of the approximate distance at which project noise would exceed ambient noise conditions to such an extent that murrelet may be subject to harassment from sound or visual disturbance. Disturbance may reach the level of take when at least one of the following conditions is met:

- Project-related sound exceeds ambient nesting conditions by 20–25 decibels
- Project-related sound, when added to ambient conditions, exceeds 90 decibels
- Human activities occur within a visual line-of-sight distance of 40 meters (m) or less from the nest

Stantec applied the harassment distances and conditions from the USFWS guidance, steps 1–5 (USFWS 2006, pages 7–8) to project conditions as currently known. Conservative assumptions are made that likely under-estimate the actual ambient sound levels and over-estimate construction sound levels.

5.0 RESULTS AND DISCUSSION

Marbled murrelets are known to occur in the region and to nest in the general project vicinity. The CNDDB contains two occurrence records (both indicating occupied status, including eggshell fragments and subcanopy flights) for murrelet in the study area: one west of Highway 101 in the vicinity of Stands 65–69 (in the Eel River valley bottom near Avenue of the Giants), and the other east of highway 101 in Stand 76. These CNDDB occurrence records are further discussed below.

Designated critical habitat for the murrelet occurs in the study area, immediately east of Highway 101 in HRSP along the northern end of Avenue of the Giants (i.e., near Stands 63 and 64 in the Eel River valley bottom).

5.1 MARBLED MURRELET HABITAT ASSESSMENT

5.1.1 Forest Stand Characteristics

This section summarizes the characteristics of the 100 forest stands identified during the desktop-level assessment and the 29 individual mature or residual trees identified during the on-the-ground evaluation. The intent of this section is to provide a thorough review of mature or older closed canopy coniferous forest stands and individual trees occurring in the study area. Potential for murrelet to occupy stands is discussed in Section 5.2.

The 100 forest stands are briefly summarized below by project segment, and characteristics for each stand are provided in Appendix A.

5.1.1.1 Bear River Ridge

Eight coniferous forest stands were identified along this segment and all are located along the north slope of Bear River Ridge. These stands are dominated by Douglas-fir and occur from about the upper 1/3 of the slope to the ridgetop. One is a relatively large stand that encompasses approximately 174 ac and has a perimeter length of 2.9 mi. A second stand is moderately sized and encompasses approximately 84 ac with a perimeter length of 2.7 mi. Two other stands continue outside of the study area and connect to form one larger stand, which encompasses approximately 41 ac. This stand is V-shaped with an overall perimeter length of 2.4 mi. The remaining stands in this segment range from about 4 to 26 ac (Appendix A).

No on-the-ground evaluations were conducted within the Bear River Ridge segment as these stands occur on private property and were not accessible. Stantec interviewed the forester that has been involved with managing these lands for over 20 years and the forester reported that all these stands, including the two largest stands, had been “clear cut” in the 1950s to 1970s; therefore, the upper age of these stands is about 70 years.

5.1.1.2 Western Monument Ridge

Twenty-one coniferous forest stands were identified along this segment and primarily occur from about the upper 1/3 of the slope to the ridgetop. Eighteen of these stands are dominated by Douglas-fir and three are dominated by redwood. Five of these stands continue outside the study area and join to form larger stands including three that merge to form a W shape and two that merge to form a V shape. The W-shaped stand encompasses approximately 78 ac and has a perimeter length of 4.0 mi, while the V-shaped stand encompasses approximately 60 ac and has a perimeter length of 2.8 mi. The remaining stands include 5 that range from 10 to 15 ac and 10 that range from 1 to 7 ac.

On-the-ground evaluations were conducted within eight of these stands, which ranged in size from 1 to 78 ac. Within these stands, the DBH of the largest tree ranged from 40 to 77 in. and the average DBH ranged from 11 to 35 in. Platforms observed included Douglas-fir and redwood branches ≥ 4 in. in diameter, covered with moss, and at least 33 ft above ground. Additionally, one broken-top tree with a mossy platform was observed in Stand 25.

5.1.1.3 EASTERN MONUMENT RIDGE

Forty coniferous forest stands were identified along this segment, which stretches from the ridgetop (Monument Ridge) to the valley bottom near Highway 101 and the northern end of Avenue of the Giants. Almost all stands along the ridgetop are dominated by Douglas-fir, while stands from the upper 1/3 of the slope to the valley bottom are dominated by redwood. The largest stand in this segment occurs along the Eel River valley bottom and encompasses approximately 283 ac and has a perimeter length of 5.6 mi. This stand is located within HRSP. Also, within HRSP and the study area is an approximately 64-ac stand with a perimeter length of 2.0 mi. Four other stands located in this segment extend outside the study area and join to form V-shaped stands including two that form an approximately 24-ac stand and two that form an approximately 9-ac stand. Of the remaining stands, 7 range in size from 13 to 42 ac and 24 range from 1 to 10 ac.

On-the-ground evaluations were conducted within 11 stands, which ranged in size from approximately 1 to 35 ac. Within these stands, the DBH of the largest tree ranged from 38 to 71 in. and the average DBH ranged from 12 to 23 in. Platforms observed included Douglas-fir and redwood branches ≥ 4 in. in diameter, covered with moss, and at

least 33 ft above ground. Additionally, broken-top trees with mossy platforms were observed in three stands ranging in size from 2 to 9 ac.

The forester for Monument Ridge, who has been managing these lands for over a decade, reported that almost the entire extent of the study area on HRC land had been harvested one or more times within the last 80–100 years and specifically noted the proximity of these forests to the mill at Scotia.

5.1.1.4 MONUMENT RIDGE – HIGHWAY 101

Six coniferous forest stands occur along this segment, which stretches from Monument Ridge east to Highway 101. Four of these stands are dominated by redwood and two are dominated by Douglas-fir. The largest stand in this segment is located on the lower 1/3 of the slope and encompasses approximately 36 ac. The stand's perimeter length is approximately 1.5 mi. The remaining five stands range in size from 2 to 14 ac.

On-the-ground evaluations were conducted within four stands including the largest stand. Within these stands, the DBH of the largest tree ranged from 34 to 90 in. and average DBH ranged from 21 to 49 in. Platforms observed included Douglas-fir and redwood branches ≥ 4 in. in diameter, covered with moss, and at least 33 ft above ground and broken-top trees with mossy platforms.

5.1.1.5 HIGHWAY 101 – SHIVELY RIDGE

Six coniferous forest stands occur along this segment, which stretches from Highway 101 east to Shively Ridge. These stands are dominated by redwood. One stand in this segment (Stand 76) (Appendix A) extends from the lower 1/3 to the upper 1/3 of the slope and encompasses approximately 136 ac. The stand's perimeter length is 3.2 mi. This stand occurs along a small watershed that drains into the Eel River north of Scotia. Two other stands extend outside the study area boundary and join to form a J-shaped stand. This J-shaped stand encompasses approximately 18 ac and has a perimeter length of 1.1 mi. The remaining stands range in size from 11 to 14 ac.

An on-the-ground evaluation was conducted within the largest stand. The DBH of the largest tree recorded was 73 in. and the average DBH was 16 in. Platforms observed included redwood branches ≥ 4 in. in diameter, covered with moss, and at least 33 ft above ground and broken-top trees with mossy platforms.

5.1.1.6 SHIVELY RIDGE

Eight coniferous forest stands occur along this segment and are located on the upper 1/3 of the slope to the ridgetop. These stands are dominated by redwood. The largest stand encompasses approximately 27 ac and has a perimeter length of 1.6 mi. The remaining stands range in size from 1 to 11 ac.

On-the-ground evaluations were conducted within three stands, which ranged in size from 2 to 9 ac. Within these stands, the DBH of the largest tree ranged from 40 to over 48 in. and the average DBH ranged from 10 to 24 in. Platforms observed included redwood branches ≥ 4 in. in diameter, covered with moss, and at least 33 ft above ground and trees with broken-tops or limb deformities with mossy platforms. The interview with the forester, who has worked with the two timber companies that have managed timber harvest along this ridgeline since the early 1900's, indicated that most of Shively Ridge had been harvested in the last 100 years (most more recently).

5.1.1.7 BRIDGEVILLE

Eleven coniferous stands occur along this segment, which stretches from Shively Ridge east to the Van Duzen River near Bridgeville. These stands are dominated by Douglas-fir. Five of these stands occur along the upper 1/3 of the slope while the remaining occur along the lower 1/3 to canyon bottom. These 11 stands range in size from 1 to 15 ac with perimeter lengths ranging from 0.2 to 1.3 mi.

On-the-ground evaluations were conducted within six stands, which ranged in size from 5 to 15 ac. Within these stands, the DBH of the largest tree ranged from 35 to over 80 in. and the average DBH ranged from 6 to 25 in. Platforms observed included Douglas-fir branches ≥ 4 in. in diameter, covered with moss, and at least 33 ft above ground. Additionally, broken-top trees and tree deformities with mossy platforms were observed in one approximately 5-ac stand.

5.1.2 Individual Trees

Twenty-nine old residual coniferous trees with suitable branch platforms were observed during on-the-ground evaluations. Twenty are Douglas-fir, eight are redwood, and one is a grand fir. Fourteen of these trees occur along the ridgetop, 14 occur at 2/3 slope, and 1 occurs in the canyon bottom. Fourteen are in close proximity to existing roads and all are either situated in younger age-class coniferous forest or are located along the edge of open habitats (e.g., grassland prairie, recently cut timber harvest unit).

In addition, several old, gnarled, windswept Douglas-fir and grand fir occur along the edge of the ridgetop prairie along Bear River Ridge and are visible from the county road.

5.2 POTENTIAL MARBLED MURRELET USE OF IDENTIFIED STANDS

5.2.1 Evaluation of Forest Stands

Stand size strongly influences the probability of nesting by murrelets; generally contiguous stands 50 ha (124 ac) or larger (Meyer et al. 2002, Meyer et al. 2007) are associated with nesting (although stands recently reduced in size by harvest may still include a nest because of the murrelet's strong fidelity to a site). Therefore, we considered any intact stand ≥124 ac to be potential nesting habitat for murrelet, if it was of sufficient age and had proper structure.

Within the study area, there are three stands ≥124 ac. These stands include Stand 1, 63, and 76 (Table 1; Appendix A). These stands are further discussed below. In addition to these three stands, there is one stand (Stand 64) containing old-growth redwood trees that is located immediately adjacent to Stand 63 that is <124 ac but was connected to Stand 63 in recent history. Due to the presence of old-growth redwoods in Stand 64 and the stand's immediate adjacency to Stand 63, it may also provide potential nesting habitat for murrelets and is also further discussed below.

Table 1. Coniferous Forest Stands Greater than 124 Acres.

Stand Number from Desktop-level Assessment	Stand Size (Ac)
1	174.29
63	283.19
76	136.15

Stand 1

Stand 1 is located on the north slope of Bear River Ridge and extends from the upper 1/3 of the slope to the ridgetop. This stand is dominated by 30- to 70-year-old Douglas-fir and grand fir trees. The stand's slope position on Bear River Ridge lends it to exposure to high winds as weather patterns move inland over the ridge from the Pacific Ocean. Per the interview with the professional forester, this stand was clear cut logged sometime between the 1950s to 1970s. More recent timber harvest operations occurred between 1999 and 2009 and are clearly visible on Google Earth historical aerial imagery. Based on stand age, past and recent timber operations, and stand slope position on Bear River Ridge; this stand does not provide habitat for nesting murrelets.

Stand 63 and 64

Stand 63 is in HRSP at the northern end of Avenue of the Giants, across Highway 101 from the project area. This stand is characterized by old-growth redwood and occurs as a contiguous block of old-growth that parallels the Eel River for approximately 2.6 mi. The stand width varies from 0.1 to 0.3 mi. Based on stand size and presence of old-growth redwoods, this stand provides potential nesting habitat for murrelet. Additionally, this stand is designated as USFWS critical habitat for murrelet.

Adjacent to Stand 63 is Stand 64, which is also located in HRSP and is designated as USFWS critical habitat. Although this stand is only 64 ac, it is characterized by old-growth redwood, and considering its adjacency to Stand 63, likely provides potential nesting habitat for murrelet.

Stand 76

Stand 76 is located on the northern slope of Shively Ridge approximately 0.5 mi from the Eel River up a small drainage. The stand extends along the drainage from the lower 1/3 to the upper 1/3 of the slope and is dominated by mature redwood with occasional Douglas-fir. The largest redwood recorded in the portion of this stand within the study area had a DBH of 73 in. (185 cm), which is less than the average of 105 in. (266 cm) for nest trees but greater than the average for all trees comprising a stand containing a nest tree on the north coast (Golightly et al. 2009). The stand extends along the drainage for approximately 1.3 mi and the width varies from 0.1 to 0.3 mi. There is one CNDDB occurrence record (1994) from this stand, where eggshell fragments were collected and adult murrelets were observed nearby by Pacific Lumber Company staff. Stantec again visited this stand on October 25, 2018, and a visual overview noted many trees characteristic of potential nesting habitat. Based on this assessment, this stand provides nesting habitat for murrelet.

Remaining Stands

Of the remaining 96 stands, 2 are moderately-sized at 85 ac (Stand 2) and 78 ac (Stands 26, 27, and 28, which form one contiguous stand outside of the study area) and both are less than 70 years old. Two additional stands are between 40 and 60 ac, 9 are between 20 and 40 ac, and 73 are less than 20 ac.

Sixty-two stands occur along the ridgetop and/or upper 1/3 of the slope including Stand 2. These stands are spread across the three ridges (i.e., Bear River Ridge, Monument Ridge, and Shively Ridge) in the study area. Of the remaining 36 stands, 5 occur from the middle to the upper 1/3 of the slope, 6 occur mid-slope, 13 occur at 1/3 slope, 7 occur from the canyon bottom to 1/3 slope; and 3 occur along the canyon bottom.

A review of Google Earth historical imagery shows that timber harvest operations occurred in portions of 64 of the 96 stands between 1999 and 2014. The interview with the forester for Monument and Shively ridges, who has been managing these lands for over a decade, reported that almost the entire extent of the study area on HRC land has been harvested within the last 80 to 100 years and specifically noted the proximity of these forests to the mill in Scotia compared to other HRC owned property. In the more recently harvested stands, trees were retained along drainages, which resulted in the odd shape of the stands and relatively high perimeter edge summarized above and included in Appendix A. Based on stand size and age class, these remaining 96 stands are too small and too young to provide reliable nesting habitat for murrelets.

5.2.2 Evaluation of Forest Stand Size Reduction or Fragmentation Over Time

Studies have found that forest stands recently (within the past 20 years) fragmented to <50 ha (124 ac) may still have a probability of being occupied by murrelets, suggesting that there is a time-lag in response to fragmentation (Meyer et al. 2002, Meyer et al. 2007). To determine if any stands where historically ≥ 50 ha (124 ac), aerial imagery and timber harvest information from the past 20 years were reviewed.

Based on review of data, in 1998 there were 10 stands identified in the desktop-level assessment that were once part of four larger (>124 ac) historical stands. These four historical stands were all reduced to less than 50 ha (124 ac) at least 14 years ago, and two have been fragmented into one or more smaller stands (Table 2).

Table 2. Reduction of Forest Stand Size and Forest Fragmentation Over Time of Four Historical Stands.

Historical Stand	Stand Number from Desktop-level Assessment	History of Stand Size			
		Stand Size (Ac) 1998	Stand Size (Ac) 1998-2004	Stand Size (Ac) 2005-2009	Stand Size (Ac) 2009-2016
Western Monument Ridge					
A[1]	26, 27, 28	224	110	78.24	78.24
Eastern Monument Ridge					
B[2]	65	145	0.61	0.61	0.61
	66		35.33	35.33	35.33
	67		3.10	3.10	3.10
	68		41.83	41.83	41.83
C[1]	69	130	30.12	30.12	30.12
Monument Ridge – Highway 101					
D[2]	74	130	22.15	13.67	13.67
	75			0.26	0.26

[1]Stand reduced in acreage
[2]Stand fragmented into two or more smaller stands

These historical stands may have once provided potential nesting habitat for murrelet but given the lapse in time and resulting stand sizes (or reduction in stand sizes), the majority no longer provide reliable nesting habitat for murrelet. The CNDDB contains a record of sub canopy flights (nesting behavior) detected by Pacific Lumber Company in 1990, 1993, and 1995 from the general area of Historical Stands B and C in Table 2. Two of the remaining stands (Stands 66 and 68) from Historical Stands B and C contain several redwood trees of sufficient size with suitable platforms to provide nesting habitat for murrelet. Several old, large-diameter (>80 in. DBH) redwood trees were selectively harvested from both stands in the past as evidenced by the presence of stumps. Due to the history of selective removal of bigger trees from these stands, and their small size and large edge ratio due to fragmentation, these two stands are unlikely to provide ongoing habitat and have a low probability of being currently occupied by murrelets. Nevertheless, because of the history of occupancy (1990, 1993, and 1995 CNDDB occurrence), the presence of several redwood trees of sufficient size with suitable platforms, and the relatively recent fragmentation (< 20 years), we consider these stands to be potential nesting habitat for murrelet.

5.2.3 Evaluation of Individual Trees

Although the twenty-nine residual old trees mapped during the habitat assessment are large with suitable platforms, they are in younger age-class forests or along the edge of open habitats and are very exposed to weather (i.e., high winds, sun exposure, temperature swings) and predators. These trees are more characteristic of roosting habitat for raptors. Murrelets are not expected to occupy these trees.

5.3 RESULTS OF AUDITORY AND VISUAL DISTURBANCE ANALYSIS

Stantec assessed the potential for the project to exceed midday period ambient noise generated in the study area per USFWS guidance (2006), steps 1–5, and accordingly, began the analysis and approximation of distances and areas within which harassment could occur to marbled murrelets.

- **Step 1** – Existing ambient sound level. The study area consists of a set of linear segments, in a range of habitats, and close to a continuum of existing human uses ranging from those with natural settings and low ambient noise (e.g., grazing lands and unharvested forest stands), to managed lands and commercial activities that can occasionally generate high ambient noise levels (e.g., road maintenance, logging). Accordingly, existing ambient sound levels are expected to range from ***Natural Ambient*** to ***High***, depending on location within the project area. At this stage we assume a ***Very Low*** existing sound level (although noting that ambient sound levels may be much higher during periods of wind near the ridge top, which commonly occurs).

- **Step 2** – Proposed action sound levels. Action-generated sound sources can be expected to range from ***Low*** (e.g., chainsaws) to ***Moderate*** (e.g., pickup truck), to ***High*** (e.g., concrete batch plant). To the extent to which these sound levels will be above existing ambient and natural background sound levels (which are expected to range from ***Natural Ambient*** to ***High***) will vary on location within the project area, and adjacent non-project land uses. At this stage we assume a ***High*** action-generated sound level during construction and decommissioning.

- **Step 3** – Estimated harassment distances. USFWS guidance (USFWS 2006) (Table 1) provides an estimate of 100 m for Very Low ambient sound levels with a High action-generated sound level during the mid-day period (i.e., two hours after sunrise to two hours before sunset). If construction occurs outside the mid-day period, USFWS guidance recommends a 150 m buffer. The no disturbance buffers extend from the outer edge of the project footprint into marbled murrelet habitat.

- **Step 4** – Sound attenuation. This may be used in the future to refine presumed noise impact disturbance areas based on local conditions and local capacity to attenuate sounds.

- **Step 5** – Human activities. Any visual disturbance planned within 40 m of potential nest branches or flight paths would be assumed to cause visual harassment.

Nesting habitat for murrelets occurs within three stands (Stands 63, 64, and 76) in the study area. Additionally, two recently fragmented stands (Stands 66 and 68) provide marginal habitat and have a low probability of being currently occupied by murrelet. Only three stands (Stands 64, 66, and 76) occur within 100 m of the project area, while all five (Stands 63, 64, 66, 68, and 76) are within 150 m of the project area. However, Stand 68 is located on the backside of a hill from the project area and given this natural barrier disturbance from project activities at this location is not anticipated. For the remaining four stands, auditory harassment could occur at these sites if construction activities take place during the breeding season and murrelets are occupying these habitats. A 100-m buffer would apply to project activities during the mid-day period while a 150-m buffer would apply to any activities outside the mid-day period. The breeding season in California extends from March 24 to September 15 and is defined by the earliest known nesting and latest known fledgling date and is used by regulatory agencies to avoid adverse effects to marbled murrelet (Evans Mack et al. 2003). Two stands (Stands 66 and 76) occur within 40 m of the project area; therefore,

visual disturbance could occur at these sites if construction activities take place during the breeding season and murrelets are occupying these stands.

6.0 CONCLUSIONS

6.1 POTENTIAL IMPACTS ON MARBLED MURRELET NESTING HABITAT

Three forest stands provide potential nesting habitat for murrelet (Stands 63, 64, and 76). In addition, two recently fragmented stands (Stands 66 and 68) provide marginal nesting habitat for murrelet. Due to the history of selective removal of bigger trees from these stands, and their small size and large edge ratio due to fragmentation, these two stands have a low probability to support nesting murrelets. Nevertheless, because of the history of occupancy (1990, 1993, and 1995 CNDDB occurrence), the presence of several redwood trees of sufficient size with suitable platforms, and the relatively recent fragmentation (< 20 years), we consider these stands to be habitat for murrelet.

Stands 63 and 64 are in HRSP and occur across Highway 101 from where the operation and maintenance facility and access road will be constructed. No construction activities are planned within either stand; therefore, the project will have no direct impact (e.g., removal, altering) on murrelet nesting habitat at these locations.

Stand 76 occurs along the gen-tie route and is located approximately 250 ft north of the project area. No construction activities will occur within this stand; therefore, the project will have no direct impact (e.g., removal, altering) on murrelet nesting habitat at this location. A review of the ridge topography at the top of this small watershed revealed a small saddle that could be used as a flyway by murrelets. However, any ingress or egress by birds nesting in the stand would likely occur low in the stand near the mouth of the watershed, away from the gen-tie and into the flyway along the Eel River.

Stands 66 and 68 occur where the operation and maintenance facility and access road will be constructed. Stand 68 is located outside of the project area and would not be directly impacted by construction of the facility or access road. Based on the current project design, approximately 14 ac of Stand 66 (which encompasses 35 ac) fall within the project area. Of these 14 ac, approximately 2.5 ac are within the current footprint of the operation and maintenance facility, as shown on Figure 2. While no suitable murrelet nest trees were observed within this portion of the stand, removal of the 2.5 ac would reduce overall stand size and constitute removal of murrelet habitat. This is the only instance of murrelet habitat removal in the project area. As such, the facility would be redesigned to avoid Stand 66, so that no murrelet habitat would be removed during project activities.

6.2 POTENTIAL MARBLED MURRELT USE OF FOREST STANDS DURING THE LIFETIME OF THE PROJECT.

All forest stands in the study area occur within managed timber lands or on private lands except Stands 63 and 64, which occur in HRSP (there are no planned activities in these two stands). Almost all of the stands outside HRSP are small and fragmented due to recent and past timber harvests and will likely remain small, young, and fragmented as the land continues to be managed for timber. Only Stands 63, 64, and 76 (which is outside HRSP) are expected to continue to provide nesting habitat for murrelets during the lifetime of the project. Additionally, two other stands

(Stand 66 and 68) provide marginal habitat. None of these potential nesting stands are adjacent to the proposed turbine sites.

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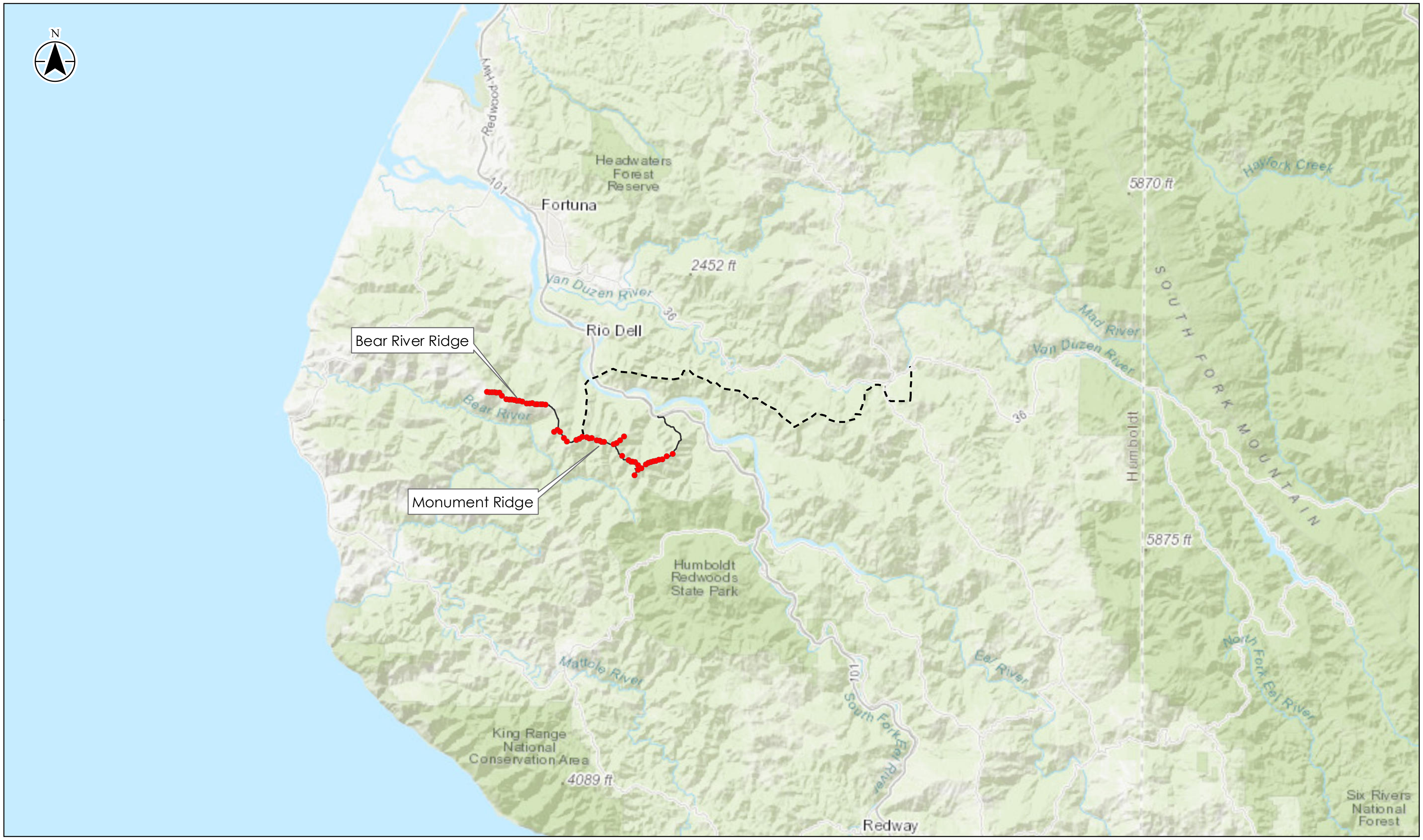
FIGURES



- Proposed Representative Wind Turbine Locations
- Generation Transmission line (Gen-Tie)
- Proposed Access Roads

0 10
Miles

1 inch = 8 miles
(At original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: ESRI World Topographic Map web mapping service.

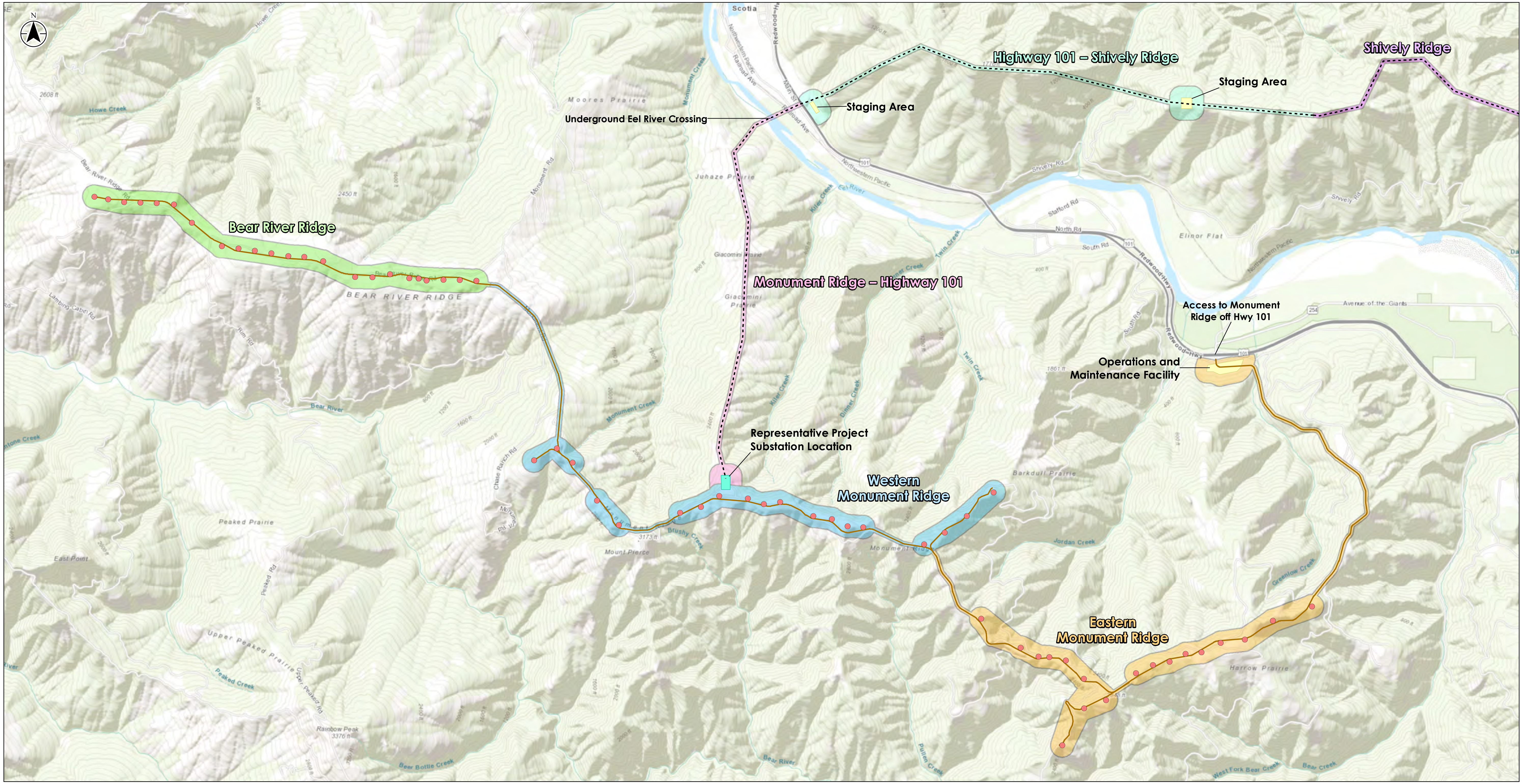
Stantec

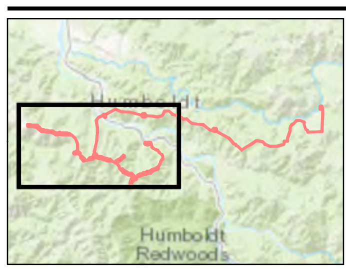
Project Location 185703758
Humboldt County, California
Prepared by PG on 2018-08-06
Technical Reviewed by YA on 2018-08-07
Independent Review by JD on 2018-08-07

Client/Project
Humboldt Wind, LLC
Humboldt Wind Energy Project

Figure No.
1

Title
General Overview





2012 Survey Protocol Project Area, by Segment

- Bear River Ridge
- Western Monument Ridge
- Monument Ridge - Highway 101
- Eastern Monument Ridge
- Highway 101 - Shively Ridge
- Shively Ridge
- Bridgeville

Project Components

- Proposed Representative Wind Turbine Locations
- Generation Transmission line (gen-tie)
- Proposed Access Roads
- Substation
- Staging Area

0 0.5 1
Miles
1:50,000 1 inch = 4,167 feet
(At original document size of 11x17)

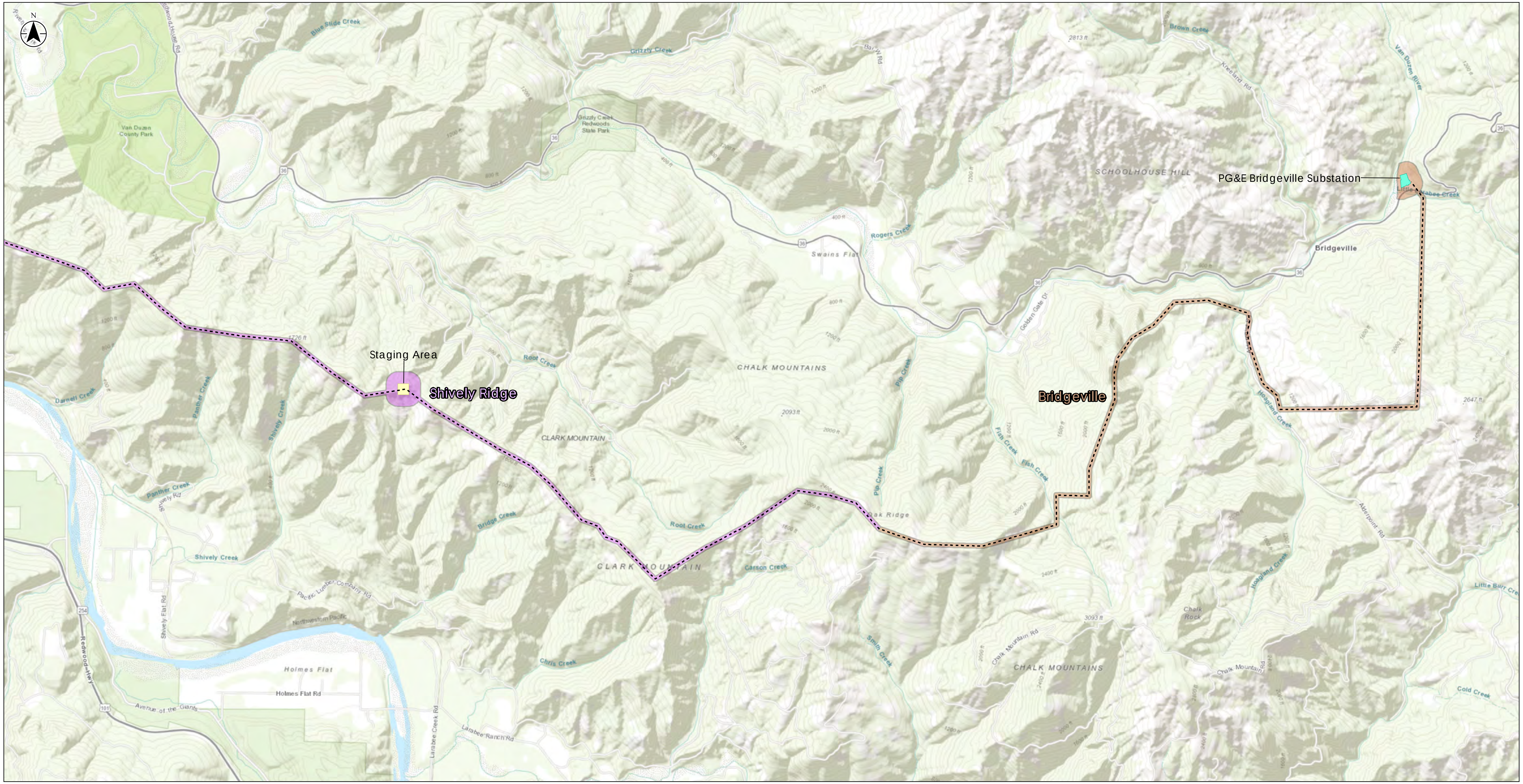
Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: Esri World Topographic Map

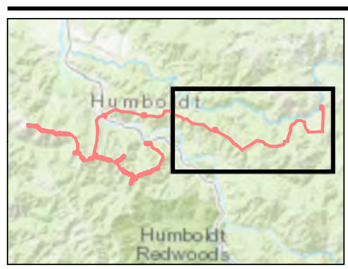
Project Location 185703758
Humboldt County, California
Prepared by PG on 2018-10-01
Technical Review by DP on 2018-10-02
Independent Review by JD on 2018-10-02

Client/Project
Humboldt Wind, LLC
Humboldt Wind Energy Project

Figure No.
2

Title
Project Area





2012 Survey Protocol Project Area, by Segment

- Bear River Ridge
- Western Monument Ridge
- Monument Ridge - Highway 101
- Eastern Monument Ridge
- Highway 101 - Shively Ridge
- Shively Ridge
- Bridgeville

Project Components

- Proposed Representative Wind Turbine Locations
- Generation Transmission line (gen-tie)
- Proposed Access Roads
- Substation
- Staging Area

0 0.5 1
Miles
1:50,000 1 inch = 4,167 feet
(At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: Esri World Topographic Map

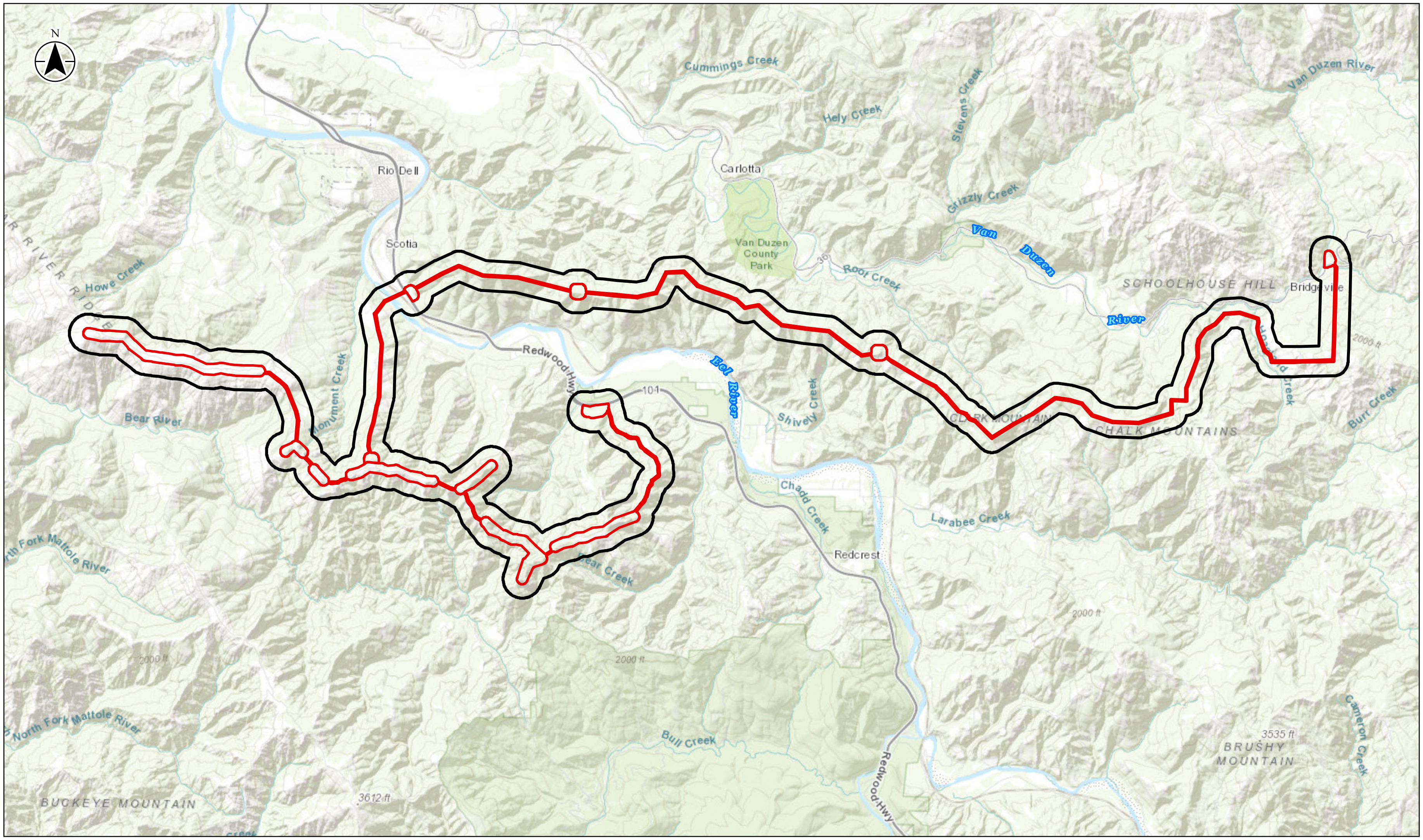
Stantec

Project Location 185703758
Humboldt County, California
Prepared by PG on 2018-10-01
Technical Review by DP on 2018-10-02
Independent Review by JD on 2018-10-02

Client/Project
Humboldt Wind, LLC
Humboldt Wind Energy Project

Figure No.
2

Title
Project Area



Project Area

Study Area (0.25-mile radius)

0 3

Miles

1 inch = 3 miles
(At original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: ESRI World Topographic Map web mapping service.

Stantec

Project Location 185703758
Humboldt County, California
Prepared by PG on 2018-10-15
Technical Review by KB on 2018-10-15
Independent Review by JD on 2018-10-15

Client/Project
Humboldt Wind, LLC
Humboldt Wind Energy Project

Figure No.
3

Title
Study Area

APPENDICES

Appendix A FOREST STANDS EVALUATED FOR POTENTIAL TO SUPPORT MARBLED MURRELET NESTING

Appendix A. Forest Stands Evaluated in the Study Area for Potential to Support Marbled Murrelet Nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Bear River Ridge												
Wind Turbine	1	4.29	170.00	174.29	2.92	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00
Wind Turbine	2	131.83	52.80	84.63	2.69	Upper 1/3 to Ridgetop	–	–	–	–	–	7.12
Wind Turbine	3	26.49	0.00	26.49	2.05	Upper 1/3 to Ridgetop	–	–	–	–	–	7.95
Wind Turbine	4 5	7.30 5.41	28.30	41.01	2.35	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00 0.00
Wind Turbine	6	9.70	2.19	11.89	0.79	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00
Wind Turbine	7	3.57	0.00	3.57	0.33	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	8	3.78	0.00	3.78	0.42	Upper 1/3	–	–	–	–	–	0.00
Western Monument Ridge												
Access Road and Electrical Collection Line	9	1.18	0.00	1.18	0.31	Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus*	55.2	35.4	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.60
Wind Turbine	10	10.32	0.00	10.32	0.61	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Abies grandis*	63.1	20.5	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	2.50
Wind Turbine	11	3.33	0.00	3.33	0.31	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	60	19	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.97
Wind Turbine	12	4.22	0.00	4.22	0.31	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	13	1.87	13.40	15.27	1.17	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	14	9.06	4.17	13.23	1.01	Upper 1/3	–	–		–	–	0.00
Wind Turbine	15	35.14	1.57	36.71	1.98	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus, Acer macrophyllum, Alnus rubra*	≥36	11.3	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.53
Wind Turbine	16	6.59	0.00	6.59	0.48	Upper 1/3	–	–	–	–	–	1.70
Wind Turbine	17	12.65	0.00	12.65	0.72	Upper 1/3	–	–	–	–	–	0.02
Wind Turbine	18	2.52	0.00	2.52	0.29	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	19 20	4.95 5.99	48.8	59.74	2.80	Upper 1/3	–	–	–	–	–	0.00 0.00
Wind Turbine	21	5.39	0.00	5.39	0.55	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	22	2.03	0.00	2.03	0.33	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	23	0.60	1.22	1.82	0.30	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	24	15.29	0.00	15.29	0.62	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	61	20	26-50	*Pseudotsuga menziesii* and *Notholithocarpus densiflorus* branches ≥ 4 inches in diameter with moss.	0.00

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Wind Turbine	25	6.85	0.00	6.85	0.79	Upper 1/3	*Pseudotsuga menziesii*	77	25	51-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Wind Turbine	26 27 28	18.59 22.26 3.12	34.30	78.27	4.03	Middle to Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Notholithocarpus densiflorus*	63.1 40 –	21.2 20 –	51-75 76-100 –	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.61 4.36 0.00
Wind Turbine	29	6.12	0.00	6.12	0.60	Ridgetop	*Pseudotsuga menziesii*	51	12	26-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	3.98
Eastern Monument Ridge												
Wind Turbine	30	2.23	0.00	2.23	0.34	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	31	2.48	3.43	5.91	0.54	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	32	1.88	0.00	1.88	0.24	Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	53	12	51-75	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.01
Wind Turbine	33	8.69	4.22	12.91	0.75	Middle 1/3	–	–	–	–	–	0.00
Wind Turbine	34	0.87	0.00	0.87	0.16	Upper 1/3	–	–	–	–	–	0.87
Wind Turbine	35	5.22	3.43	8.65	0.97	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	36	0.91	0.00	0.91	0.19	Upper 1/3	–	–	–	–		0.33
Wind Turbine	37	0.48	0.00	0.48	0.12	Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens*	71.2	18	26-50	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.48
Wind Turbine	38	7.51	0.00	7.51	0.59	Upper 1/3 to Ridgetop	–	–	–	–		4.06
Wind Turbine	39	22.37	11.60	33.97	1.44	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	56.8	16	51-75	*Pseudotsuga menziesii* and *Notholithocarpus densiflorus* branches ≥ 4 inches in diameter with moss.	0.00
Wind Turbine	40	4.12	0.00	4.12	0.31	Upper 1/3	–	–	–	–		0.84
Wind Turbine	41	1.92	0.00	1.92	0.29	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	45.4	12	51-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.07
Wind Turbine	42 46	6.56 11.37	6.11	24.04	1.49	Middle to Upper 1/3	– –	– –	– –	– –	– –	0.00 0.00
Wind Turbine	43	3.38	0.00	3.38	0.48	Upper 1/3 to Ridgetop	–	–	–	–	–	1.94
Wind Turbine	44	1.51	0.00	1.51	0.33	Ridgetop	*Pseudotsuga menziesii*	≥36	–	–	–	1.45
Wind Turbine	45	0.63	0.00	0.63	0.19	Ridgetop	*Pseudotsuga menziesii*	≥36	–	–	–	0.63
Wind Turbine	47	3.20	0.00	3.20	0.63	Upper 1/3	–	–	–	–	–	0.77

Appendix A Forest Stands Evaluated for Potential to Support marbled Murrelet nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Wind Turbine	48	4.73	0.00	4.73	0.41	Upper 1/3	–	–	–	–	–	2.76
Wind Turbine	49	0.82	0.00	0.82	0.21	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	50	28.14	1.82	29.96	2.31	Middle 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	40	16	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.13
Wind Turbine	51	16.59	0.00	16.59	0.90	Upper 1/3	–	–	–	–	–	1.13
Wind Turbine	52	8.11	0.00	8.11	0.71	Upper 1/3 to Ridgetop	*Sequoia sempervirens/ Pseudotsuga menziesii*	46	12	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	3.51
Wind Turbine	53	4.29	0.00	4.29	0.39	Middle 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	≥48	15	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss.	0.01
Wind Turbine	54	6.51	12.60	19.11	1.05	Middle 1/3	–	–	–	–	–	0.00
Access Road	55	2.14	2.10	4.24	0.40	Lower 1/3	–	–	–	–	–	0.00
Access Road	56 57	1.54 4.03	3.31	8.88	0.65	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	48 38	15 18	0-75 26-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	0.00 0.00
Access Road	58	9.57	0.00	9.57	0.69	Lower 1/3	–	–	–	–	–	0.12
Access Road	59	2.81	23.2	25.83	1.20	Lower 1/3	–	–	–	–	–	0.00
Access Road	60	14.51	0.00	14.51	0.79	Lower 1/3	–	–	–	–	–	0.70
Access Road	61	12.12	11.60	23.72	1.61	Lower 1/3	–	–	–	–	–	0.00
Access Road	62	4.17	0.00	4.17	0.47	Lower 1/3	–	–	–	–	–	1.95
O&M Facility	63	14.19	269	283.19	5.56	Bottom	–	–	–	–	–	0.00
O&M Facility	64	50.54	13.60	64.14	2.00	Bottom	–	–	–	–	–	0.00
O&M Facility	65	0.61	0.00	0.61	0.13	Bottom	–	–	–	–	–	0.61
O&M Facility	66	35.33	0.00	35.33	1.55	Bottom to Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Acer macrophyllum*	100[3]	23.2	76-100	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	13.86[4]
O&M Facility	67	3.10	0.00	3.10	0.30	Lower 1/3	–	–	–	–	–	0.00
O&M Facility	68	9.93	31.9	41.83	0.74	Bottom to Lower 1/3	*Sequoia sempervirens*	100	–	–	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss.	0.00

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
O&M Facility	69	9.72	20.40	30.12	1.54	Bottom to Lower 1/3	*Sequoia sempervirens*	60	–	–	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss.	0.00
Monument Ridge – Highway 101												
Wind Turbine	70	0.45	1.34	1.79	0.52	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	71	7.46	2.10	9.56	0.72	Middle 1/3	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus*	56.3	28.3	76-100	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Gen-tie	72	5.19	0.00	5.19	0.37	Middle 1/3	*Sequoia sempervirens*	≥48	46.1	0-25	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Gen-tie	73	36.06	0.00	36.06	1.50	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	90	49	0-25	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	1.04
Gen-tie	74	3.17	10.50	13.67	0.74	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Umbellularia californica*	34.5	21.1	51-75	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	75	0.45	1.77	2.22	0.26	Bottom	–	–	–	–	–	0.00
Highway 101 – Shively Ridge												
Gen-tie	76	14.15	122	136.15	3.23	Lower 1/3 to Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	73	16	26-50	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	0.00
Gen-tie	77 78	2.57 6.98	8.44	17.99	1.14	Upper 1/3 to Ridgetop	– –	– –	– –	– –	– –	0.00
Gen-tie	79	7.52	6.10	13.62	0.74	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	80	6.38	4.96	11.34	0.66	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	81	1.24	10.00	11.24	0.70	Upper 1/3	–	–	–	–	–	0.00
Shively Ridge												
Gen-tie	82	2.91	6.52	9.43	0.72	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	83	0.90	1.44	2.34	0.26	Upper 1/3	–	–	–	–	–	0.00

Appendix A Forest Stands Evaluated for Potential to Support marbled Murrelet nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Gen-tie	84	5.39	3.85	9.24	0.74	Upper 1/3	*Sequoia sempervirens*	≥48	24	75-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	85	2.03	1.97	4.00	0.43	Upper 1/3	*Sequoia sempervirens*	≥48	24	75-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	86	4.32	6.74	11.06	0.89	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	87	18.56	8.00	26.56	1.60	Upper 1/3	–	–	–	–	–	0.01
Gen-tie	88	1.42	0.00	1.42	0.25	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	89	2.32	0.00	2.32	0.29	Ridgetop	*Sequoia sempervirens/ Pseudotsuga menziesii*	45	10	26-50	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss.	0.00
Bridgeville												
Gen-tie	90	3.12	10.90	14.02	1.29	Upper 1/3	*Pseudotsuga menziesii*	35	6	0-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	91	1.86	6.73	8.59	0.90	Upper 1/3	*Pseudotsuga menziesii*	35	6	0-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	92	1.19	4.50	5.69	0.46	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	93	5.35	0.00	5.35	0.43	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Umbellularia californica, Acer macrophyllum*	40	25	51-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	94	13.72	0.00	13.72	0.76	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Acer macrophyllum, Umbellularia californica*	≥80	18	26-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	95	7.61	3.38	10.99	0.71	Lower 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	60	25	26-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	96	8.45	2.10	10.55	0.59	Bottom to Lower 1/3	–	–	–	–	–	0.00
Gen-tie	97	14.86	0.00	14.86	0.83	Lower 1/3	*Pseudotsuga menziesii*	48	16	26-50	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	98	12.92	0.00	12.92	0.65	Bottom to Lower 1/3	–	–	–	–	–	0.00

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Gen-tie	99	1.00	0.00	1.00	0.18	Bottom to Lower 1/3	–	–	–	–	–	0.00
Gen-tie	100	13.72	0.00	13.72	0.90	Bottom to Lower 1/3	–	–	–	–	–	0.00
Bear River Ridge												
Wind Turbine	1	4.29	170.00	174.29	2.92	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00
Wind Turbine	2	131.83	52.80	84.63	2.69	Upper 1/3 to Ridgetop	–	–	–	–	–	7.12
Wind Turbine	3	26.49	0.00	26.49	2.05	Upper 1/3 to Ridgetop	–	–	–	–	–	7.95
Wind Turbine	4 5	7.30 5.41	28.30	41.01	2.35	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00 0.00
Wind Turbine	6	9.70	2.19	11.89	0.79	Upper 1/3 to Ridgetop	–	–	–	–	–	0.00
Wind Turbine	7	3.57	0.00	3.57	0.33	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	8	3.78	0.00	3.78	0.42	Upper 1/3	–	–	–	–	–	0.00
Western Monument Ridge												
Access Road and Electrical Collection Line	9	1.18	0.00	1.18	0.31	Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus*	55.2	35.4	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.60
Wind Turbine	10	10.32	0.00	10.32	0.61	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Abies grandis*	63.1	20.5	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	2.50
Wind Turbine	11	3.33	0.00	3.33	0.31	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	60	19	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.97
Wind Turbine	12	4.22	0.00	4.22	0.31	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	13	1.87	13.40	15.27	1.17	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	14	9.06	4.17	13.23	1.01	Upper 1/3	–	–		–	–	0.00
Wind Turbine	15	35.14	1.57	36.71	1.98	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus, Acer macrophyllum, Alnus rubra*	≥36	11.3	76-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.53
Wind Turbine	16	6.59	0.00	6.59	0.48	Upper 1/3	–	–	–	–	–	1.70
Wind Turbine	17	12.65	0.00	12.65	0.72	Upper 1/3	–	–	–	–	–	0.02
Wind Turbine	18	2.52	0.00	2.52	0.29	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	19 20	4.95 5.99	48.8	59.74	2.80	Upper 1/3	–	–	–	–	–	0.00 0.00
Wind Turbine	21	5.39	0.00	5.39	0.55	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	22	2.03	0.00	2.03	0.33	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	23	0.60	1.22	1.82	0.30	Upper 1/3	–	–	–	–	–	0.00

Appendix A Forest Stands Evaluated for Potential to Support marbled Murrelet nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Wind Turbine	24	15.29	0.00	15.29	0.62	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	61	20	26-50	*Pseudotsuga menziesii* and *Notholithocarpus densiflorus* branches ≥ 4 inches in diameter with moss.	0.00
Wind Turbine	25	6.85	0.00	6.85	0.79	Upper 1/3	*Pseudotsuga menziesii*	77	25	51-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Wind Turbine	26 27 28	18.59 22.26 3.12	34.30	78.27	4.03	Middle To Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Notholithocarpus densiflorus*	63.1 40 –	21.2 20 –	51-75 76-100 –	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.61 4.36 0.00
Wind Turbine	29	6.12	0.00	6.12	0.60	Ridgetop	*Pseudotsuga menziesii*	51	12	26-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	3.98
Eastern Monument Ridge												
Wind Turbine	30	2.23	0.00	2.23	0.34	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	31	2.48	3.43	5.91	0.54	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	32	1.88	0.00	1.88	0.24	Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	53	12	51-75	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.01
Wind Turbine	33	8.69	4.22	12.91	0.75	Middle 1/3	–	–	–	–	–	0.00
Wind Turbine	34	0.87	0.00	0.87	0.16	Upper 1/3	–	–	–	–	–	0.87
Wind Turbine	35	5.22	3.43	8.65	0.97	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	36	0.91	0.00	0.91	0.19	Upper 1/3	–	–	–	–		0.33
Wind Turbine	37	0.48	0.00	0.48	0.12	Ridgetop	*Pseudotsuga menziesii/ Sequoia sempervirens*	71.2	18	26-50	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.48
Wind Turbine	38	7.51	0.00	7.51	0.59	Upper 1/3 to Ridgetop	–	–	–	–		4.06
Wind Turbine	39	22.37	11.60	33.97	1.44	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	56.8	16	51-75	*Pseudotsuga menziesii* and *Notholithocarpus densiflorus* branches ≥ 4 inches in diameter with moss.	0.00
Wind Turbine	40	4.12	0.00	4.12	0.31	Upper 1/3	–	–	–	–		0.84
Wind Turbine	41	1.92	0.00	1.92	0.29	Upper 1/3 to Ridgetop	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	45.4	12	51-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.07

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Wind Turbine	42 46	6.56 11.37	6.11	24.04	1.49	Middle to Upper 1/3	– –	– –	– –	– –	– –	0.00 0.00
Wind Turbine	43	3.38	0.00	3.38	0.48	Upper 1/3 to Ridgetop	–	–	–	–	–	1.94
Wind Turbine	44	1.51	0.00	1.51	0.33	Ridgetop	*Pseudotsuga menziesii*	≥36	–	–	–	1.45
Wind Turbine	45	0.63	0.00	0.63	0.19	Ridgetop	*Pseudotsuga menziesii*	≥36	–	–	–	0.63
Wind Turbine	47	3.20	0.00	3.20	0.63	Upper 1/3	–	–	–	–	–	0.77
Wind Turbine	48	4.73	0.00	4.73	0.41	Upper 1/3	–	–	–	–	–	2.76
Wind Turbine	49	0.82	0.00	0.82	0.21	Upper 1/3	–	–	–	–	–	0.00
Wind Turbine	50	28.14	1.82	29.96	2.31	Middle 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	40	16	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	1.13
Wind Turbine	51	16.59	0.00	16.59	0.90	Upper 1/3	–	–	–	–	–	1.13
Wind Turbine	52	8.11	0.00	8.11	0.71	Upper 1/3 to Ridgetop	*Sequoia sempervirens/ Pseudotsuga menziesii*	46	12	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	3.51
Wind Turbine	53	4.29	0.00	4.29	0.39	Middle 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	≥48	15	26-75	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss.	0.01
Wind Turbine	54	6.51	12.60	19.11	1.05	Middle 1/3	–	–	–	–	–	0.00
Access Road	55	2.14	2.10	4.24	0.40	Lower 1/3	–	–	–	–	–	0.00
Access Road	56 57	1.54 4.03	3.31	8.88	0.65	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	48 38	15 18	0-75 26-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	0.00 0.00
Access Road	58	9.57	0.00	9.57	0.69	Lower 1/3	–	–	–	–	–	0.12
Access Road	59	2.81	23.2	25.83	1.20	Lower 1/3	–	–	–	–	–	0.00
Access Road	60	14.51	0.00	14.51	0.79	Lower 1/3	–	–	–	–	–	0.70
Access Road	61	12.12	11.60	23.72	1.61	Lower 1/3	–	–	–	–	–	0.00
Access Road	62	4.17	0.00	4.17	0.47	Lower 1/3	–	–	–	–	–	1.95
O&M Facility	63	14.19	269	283.19	5.56	Bottom	–	–	–	–	–	0.00
O&M Facility	64	50.54	13.60	64.14	2.00	Bottom	–	–	–	–	–	0.00
O&M Facility	65	0.61	0.00	0.61	0.13	Bottom	–	–	–	–	–	0.61
O&M Facility	66	35.33	0.00	35.33	1.55	Bottom to Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Acer macrophyllum*	100[3]	23.2	76-100	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	13.86

Appendix A Forest Stands Evaluated for Potential to Support marbled Murrelet nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
O&M Facility	67	3.10	0.00	3.10	0.30	Lower 1/3	–	–	–	–	–	0.00
O&M Facility	68	9.93	31.9	41.83	0.74	Bottom to Lower 1/3	*Sequoia sempervirens*	100	–	–	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss.	0.00
O&M Facility	69	9.72	20.40	30.12	1.54	Bottom to Lower 1/3	*Sequoia sempervirens*	60	–	–	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss.	0.00
Monument Ridge – Highway 101												
Wind Turbine	70	0.45	1.34	1.79	0.52	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	71	7.46	2.10	9.56	0.72	Middle 1/3	*Pseudotsuga menziesii/ Sequoia sempervirens, Notholithocarpus densiflorus*	56.3	28.3	76-100	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Gen-tie	72	5.19	0.00	5.19	0.37	Middle 1/3	*Sequoia sempervirens*	≥48	46.1	0-25	*Sequoia sempervirens* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	0.00
Gen-tie	73	36.06	0.00	36.06	1.50	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	90	49	0-25	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Broken top tree with mossy platform.	1.04
Gen-tie	74	3.17	10.50	13.67	0.74	Lower 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii, Umbellularia californica*	34.5	21.1	51-75	*Sequoia sempervirens* and *Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	75	0.45	1.77	2.22	0.26	Bottom	–	–	–	–	–	0.00
Highway 101 – Shively Ridge												
Gen-tie	76	14.15	122	136.15	3.23	Lower 1/3 to Upper 1/3	*Sequoia sempervirens/ Pseudotsuga menziesii*	73	16	26-50	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Broken top tree with mossy platform.	0.00
Gen-tie	77 78	2.57 6.98	8.44	17.99	1.14	Upper 1/3 to Ridgetop	– –	– –	– –	– –	– –	0.00
Gen-tie	79	7.52	6.10	13.62	0.74	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	80	6.38	4.96	11.34	0.66	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	81	1.24	10.00	11.24	0.70	Upper 1/3	–	–	–	–	–	0.00

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Shively Ridge												
Gen-tie	82	2.91	6.52	9.43	0.72	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	83	0.90	1.44	2.34	0.26	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	84	5.39	3.85	9.24	0.74	Upper 1/3	*Sequoia sempervirens*	≥48	24	75-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	85	2.03	1.97	4.00	0.43	Upper 1/3	*Sequoia sempervirens*	≥48	24	75-100	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	86	4.32	6.74	11.06	0.89	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	87	18.56	8.00	26.56	1.60	Upper 1/3	–	–	–	–	–	0.01
Gen-tie	88	1.42	0.00	1.42	0.25	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	89	2.32	0.00	2.32	0.29	Ridgetop	*Sequoia sempervirens/ Pseudotsuga menziesii*	45	10	26-50	*Sequoia sempervirens* ≥ 4 inches in diameter with little to no moss.	0.00
Bridgeville												
Gen-tie	90	3.12	10.90	14.02	1.29	Upper 1/3	*Pseudotsuga menziesii*	35	6	0-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	91	1.86	6.73	8.59	0.90	Upper 1/3	*Pseudotsuga menziesii*	35	6	0-75	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	92	1.19	4.50	5.69	0.46	Upper 1/3	–	–	–	–	–	0.00
Gen-tie	93	5.35	0.00	5.35	0.43	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Umbellularia californica, Acer macrophyllum*	40	25	51-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss. Mossy broken top tree and tree deformities providing platforms.	0.00
Gen-tie	94	13.72	0.00	13.72	0.76	Upper 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus, Acer macrophyllum, Umbellularia californica*	≥80	18	26-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	95	7.61	3.38	10.99	0.71	Lower 1/3	*Pseudotsuga menziesii/ Notholithocarpus densiflorus*	60	25	26-100	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00
Gen-tie	96	8.45	2.10	10.55	0.59	Bottom to Lower 1/3	–	–	–	–	–	0.00
Gen-tie	97	14.86	0.00	14.86	0.83	Lower 1/3	*Pseudotsuga menziesii*	48	16	26-50	*Pseudotsuga menziesii* branches ≥ 4 inches in diameter with moss.	0.00

Appendix A Forest Stands Evaluated for Potential to Support marbled Murrelet nesting

Project Component	Stand #	Stand Size Within Study Area[1] (Acres)	Stand Size Outside Study Area (Acres)	Total Stand Size (Acres)	Stand Perimeter (Miles)	Position on Slope	Dominant/ Co-dominant Tree Species (Scientific Name)	Largest DBH Conifer Tree	Avg. DBH Conifer Tree	Percent Canopy Closure	Potential Nest Platform Types	Portion of Stand within the Project Area[2] (Acres)
Gen-tie	98	12.92	0.00	12.92	0.65	Bottom to Lower 1/3	–	–	–	–	–	0.00
Gen-tie	99	1.00	0.00	1.00	0.18	Bottom to Lower 1/3	–	–	–	–	–	0.00
Gen-tie	100	13.72	0.00	13.72	0.90	Bottom to Lower 1/3	–	–	–	–	–	0.00

[1]Study Area encompasses 16,139 acres and includes the project area and a 0.25-mi radius around the project area.
[2]Project Area includes a 1,000-foot-(ft-) wide corridor centered on proposed turbine locations; a 200-ft-wide corridor centered on project roads, the electrical collection line, and the gen-tie; and a 500-ft-wide buffer around proposed staging and temporary impact areas and project substations, encompassing 2,241 acres.
[3]Redwood tree with DBH of 100 inches located outside of project area.

Appendix B REPRESENTATIVE PHOTOGRAPHS

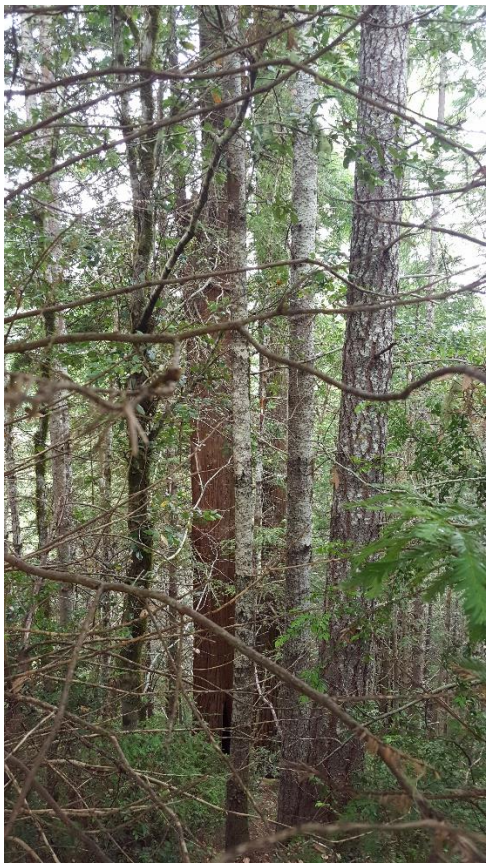
Appendix B. Representative Photographs

Photograph 1. Bear River Ridge – Stand 3 from top of ridge looking north. Several old, gnarled, windswept Douglas-fir and grand fir trees, such as the conifer tree shown above, occur at the edge of the stand along the ridgetop. These old conifers are not considered potential habitat due to their proximity to edge habitat (i.e., grassland prairie) and exposure to high winds as weather patterns move inland over the ridge from the Pacific Ocean. Trees within the core of this stand are between 30 and 70 years old.

Photograph 2. Western Monument Ridge – Stand 24 looking northeast.

Photograph 3. Western Monument Ridge – Stand 25 looking southwest.

Photograph 4. Western Monument Ridge – Stand 27 looking north.



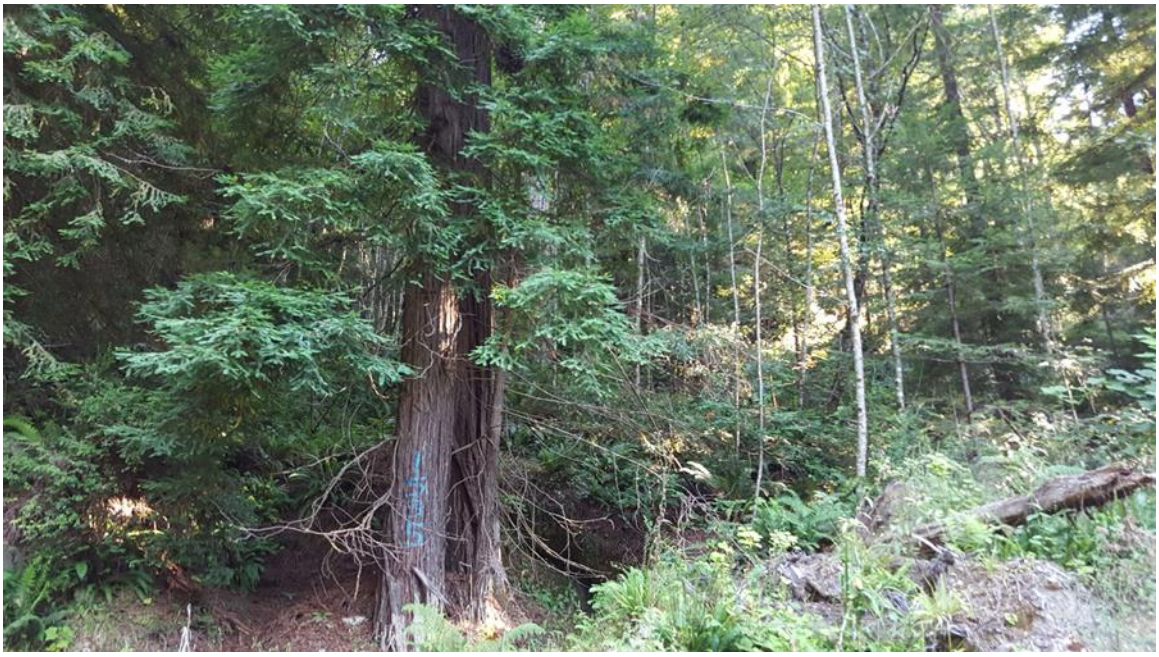
Photograph 5. Eastern Monument Ridge – Stand 32 looking north.

Photograph 6. Eastern Monument Ridge – Stand 53 looking northeast.

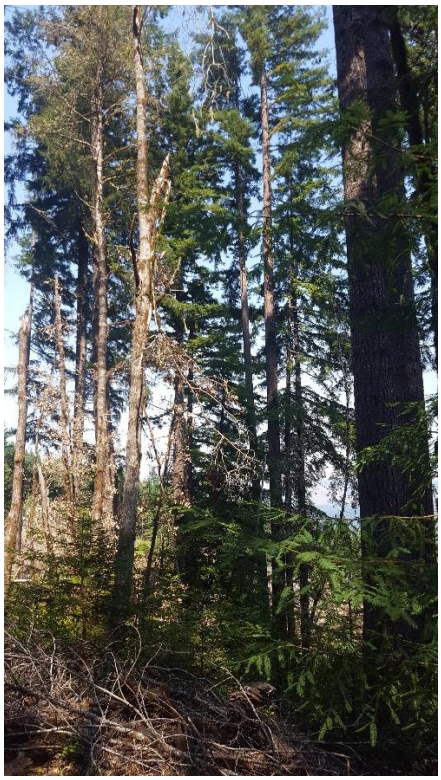
Photograph 7. Eastern Monument Ridge – Stand 66 looking northeast.

Photograph 8. Monument Ridge – Highway 101 – Stand 73 looking west.

Photograph 9. Highway 101 – Shively Ridge – Stand 76 looking south toward Shively Ridge.



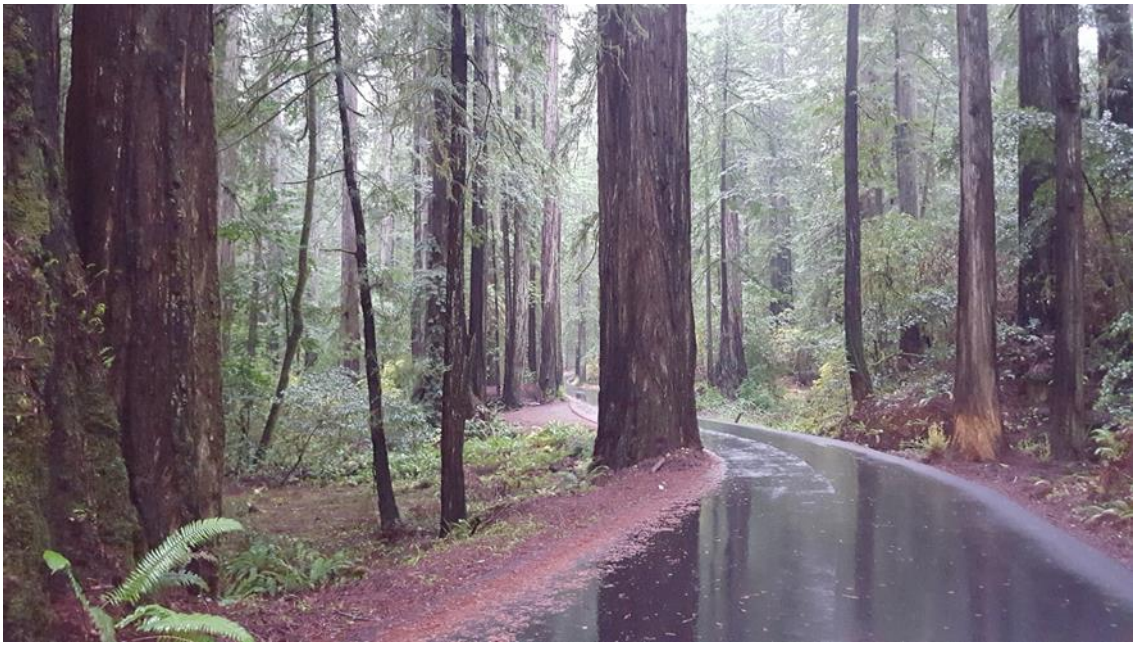
Photograph 10. Shively Ridge – Stand 85 looking southwest toward Shively Ridge.



Photograph 10. Shively Ridge – Stand 89 looking northwest.

Photograph 11. Shively Ridge – Stand 90 looking south.

Photograph 3. Bridgeville – Stand 94 looking northwest toward the Van Duzen River.



Photograph 4. Humboldt Redwood State Park – Representative old-growth redwood within the park.