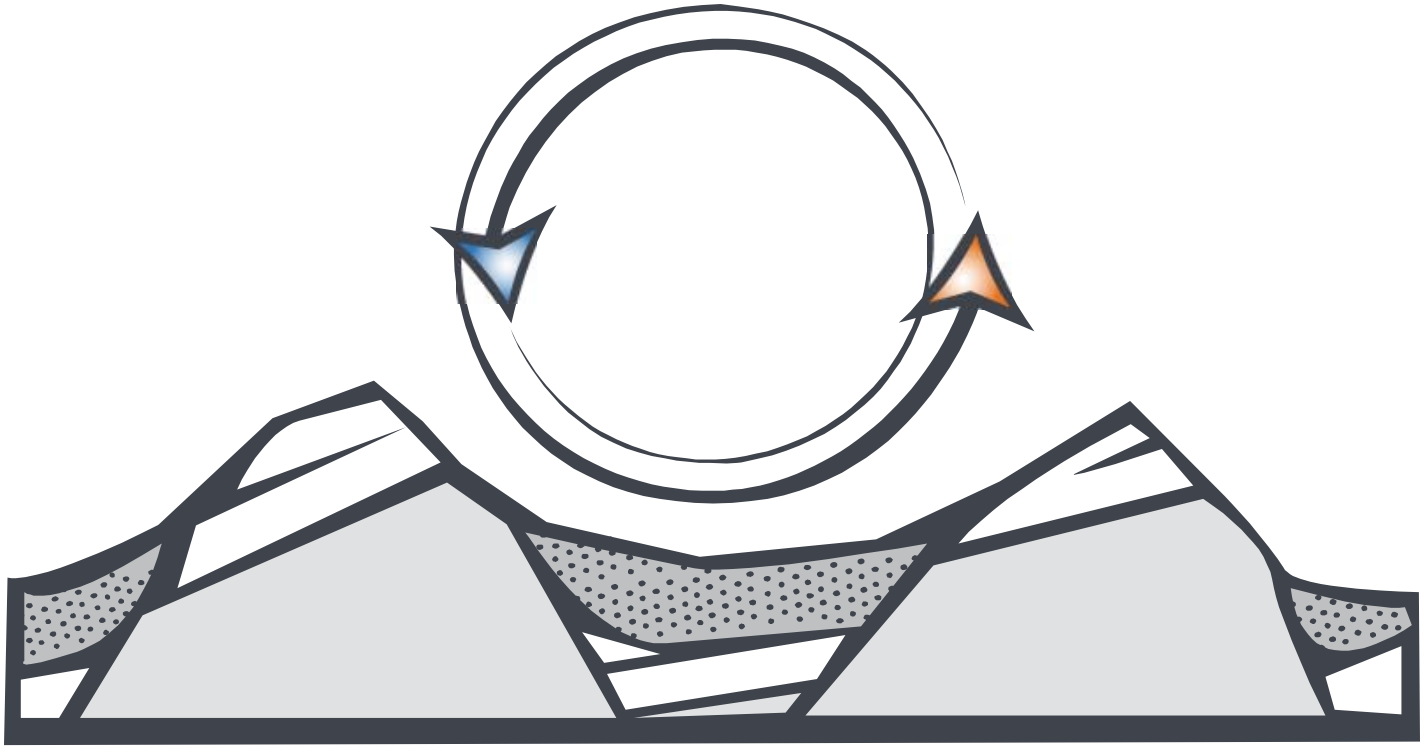


CHAPTER 11

TONGASS NATIONAL FOREST

ANCHORAGE DISTRICT

ANALYSIS FOR PENDING LEASE APPLICATIONS:

AK 084543, AK 084544, AK 084545

This Page Intentionally Left Blank

TABLE OF CONTENTS

Section Page

11.1 INTRODUCTION 11-1

11.1.1 Introduction 11-1
11.1.2 Local Regulatory Considerations 11-1
Tongass National Forest Land and Resources Management Plan (2008) 11-1
Ring of Fire Resource Management Plan (2008) 11-3
11.1.3 Scope of Analysis and Approach 11-5
11.1.4 Cumulative Actions 11-5

11.2 PROPOSED ACTION AND ALTERNATIVES 11-7

11.2.1 Introduction 11-7
11.2.2 Proposed Action 11-7
Lease AK 084543 11-7
Lease AK 084544 11-9
Lease AK 084545 11-10
11.2.3 Alternatives 11-10
Alternative A: No Action 11-11
Alternative B: Leasing with Stipulations 11-11
11.2.4 Reasonably Foreseeable Development Scenario 11-11

11.3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 11-13

11.3.1 Introduction and Geographic Setting 11-13
11.3.2 Land Use and Recreation 11-13
Setting 11-13
Impacts 11-15
11.3.3 Geologic Resources and Seismicity 11-16
Setting 11-16
Impacts 11-16
11.3.4 Energy and Minerals 11-17
Setting 11-17
Impacts 11-18
11.3.5 Soils 11-19
Setting 11-19
Impacts 11-19
11.3.6 Water Resources 11-20
Setting 11-20
Impacts 11-21
11.3.7 Air Quality and Atmospheric Values 11-22
Setting 11-22

Impacts 11-22
11.3.8 Vegetation 11-22
Setting 11-22
Impacts 11-24
11.3.9 Fish and Wildlife 11-26
Setting 11-26
Impacts 11-27
11.3.10 Threatened and Endangered Species and Special Status Species 11-30
Setting 11-30
Impacts 11-31
11.3.11 Cultural Resources 11-31
Setting 11-31
Impacts 11-34
11.3.12 Tribal Interests and Traditional Cultural Resources 11-35
Setting 11-35
Impacts 11-36
11.3.13 Visual Resources 11-38
Setting 11-38
Impacts 11-39
11.3.14 Socioeconomics and Environmental Justice 11-40
Setting 11-40
Impacts 11-42
11.3.15 Noise 11-43
Setting 11-43
Impacts 11-43

11.4 REFERENCES 11-45

FIGURES

Page

Figure 11-1 Tongass Lease Locations 11-8

TABLES

Page

Table 11.3-1 Forest Service Region 10 Sensitive Plant Species Known or Expected to Occur on Bell Island. 11-30
Table 11.3-2 Cultural Resources in the Proposed Lease Areas 11-34
Table 11.3-3 Population Percentage by Race/Ethnicity in Prince of Wales-Outer Ketchikan Census Area 11-41

SECTION 11.1
INTRODUCTION

11.1.1 INTRODUCTION

This analysis describes the environmental effects of leasing approximately 7,680 acres of NFS land within the Ketchikan-Misty Fiords Ranger District of the Tongass NF, within the BLM Anchorage District to private industry for the development of geothermal resources.

The pending lease sites are within the Tongass NF, which is the surface management agency for the lease sites. Subsurface mineral rights (including leasable minerals such as geothermal) are managed by the BLM Alaska State Office, which issues leases with the consent of the FS (here, the Ketchikan-Misty Fiords Ranger District of the Tongass NF) for the lands under application in the Tongass NF.

This lease-specific analysis serves as an information resource to aid decision-makers in determining whether these lands are appropriate for leasing under FS and BLM management policies and existing environmental regulations.

11.1.2 LOCAL REGULATORY CONSIDERATIONS

The pending lease application sites are located within Ketchikan Gateway Borough, Alaska and are subject to state and local regulations, as described below.

Tongass National Forest Land and Resources Management Plan (2008)

The Tongass National Forest Land and Resources Management Plan (Forest Plan) guides all natural resource management activities and establishes management standards and guidelines for the Tongass National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

The Forest Plan identifies the following resource management goals that apply to geothermal leasing:

- Minerals and Energy – Provide for environmentally sound mineral exploration, development, and reclamation in areas open to mineral entry and in areas with valid existing rights that are otherwise closed to mineral entry. Seek withdrawal of specific locations where mineral development may not meet Land Use Designation objectives.
- Economic – Provide for environmentally sound mineral exploration, development, and reclamation in areas open to mineral entry and in areas with valid existing rights that are otherwise closed to mineral entry. Seek withdrawal of specific locations where mineral development may not meet Land Use Designation objectives.
- Wildlife, Fish, and Plants – Maintain healthy forest ecosystems; maintain a mix of habitats at different spatial scales (i.e., site, watershed, island, province and forest) capable of supporting the full range of naturally occurring flora, fauna, and ecological processes native to Southeast Alaska.

The Forest Plan identifies the following forest-wide standards and guidelines that apply to geothermal activity:

- Encourage the exploration, development, and extraction of locatable and leasable minerals and energy resources.
- A Notice of Intent and/or a plan of operations is required for locatable, leasable, and salable minerals (Consult FSM 2810, 2820, 2850, and 36 CFR 228).
- A plan of operations will receive prompt evaluation and action within the time frames established in 36 CFR 228.
- Conduct an environmental analysis with appropriate documentation for all operating plans.
- Work with claimants to develop a plan of operations that adequately mitigates adverse impacts on Land Use Designation objectives. Include mitigation measures for locatable and salable minerals and standard and special stipulations in leasing actions that are compatible with the scale of proposed development and commensurate with potential resource impacts.
    1. Maintain the habitats, to the maximum extent feasible, of anadromous fish and other foodfish, and maintain the present and continued productivity of such habitats when such habitats are affected by mining activities. Assess the effects on

populations of such fish in consultation with appropriate state agencies (Consult ANILCA, Section 505(a)).

2. Apply appropriate Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads and facilities.
3. Reclaim disturbed areas in accordance with an approved plan of operations.
4. Apply best management practices to maintain water quality for the beneficial uses of water (Consult Appendix C of the Tongass Forest Plan and FSH 2509.22).
5. Periodically inspect minerals activities to determine if the operator is complying with the regulations of 36 CFR 228 and the approved plan of operations.

- A bond may be required for locatable, leasable, and salable mineral operations to ensure operator performance and site reclamation are completed.
- Permit mineral material sites only after an environmental analysis assures other resources are adequately protected, the site location and operating plan are consistent with the Land Use Designation emphasis, and such resources are not reasonably available on private land. Require bonds and reclamation as appropriate (Consult FSM 2850 and 36 CFR 228).
- Where the opportunity exists, design, excavate, and reclaim material sites to facilitate their use for dispersed recreation or other desirable uses such as conversion to salmonid rearing ponds and spawning channels.

Ring of Fire Resource Management Plan (2008)

The pending lease sites are on NFS land; however, subsurface mineral rights are managed by the BLM. The lease area is within the BLM Anchorage District, which is managed by the Ring of Fire Resource Management Plan. The vision of the Ring of Fire Resource Management Plan is to provide the basis for developing future site-specific implementation planning on 1.3 million acres of public land and the underlying subsurface estate of that land, as well as certain BLM-managed subsurface estate underlying areas in non-federal ownership, or administered by other federal agencies. There are several basic principles supporting this vision:

- Natural resources can be managed to provide for human use and a healthy environment;
- Resource management must be focused on ecological principles to reduce the need for single resource or single species management;

- Stewardship, the involvement of people working with natural processes, is essential for successful implementation;
- The BLM cannot achieve this vision alone but can, by its management processes and through cooperation with others, be a significant contributor to its achievement; and
- A carefully designed program of monitoring, research and adaptation will be the change mechanism for achieving this vision.

The Leasable Minerals section of the Ring of Fire Resource Management Plan states the following objectives:

- Maintain of enhance opportunity for mineral exploration and development while maintaining other resource values.
- Public lands and the Federal mineral estate will be made available for orderly and efficient exploration, development, and production unless withdrawal or other administrative action is justified in the national interest.
- In addition to oil and gas, geothermal resources would be available for leasing in areas open to oil and gas leasing.

The Resource Management Plan includes the following Management Actions/Direction regarding leasable minerals:

- Segregation of lands currently under selection by the State and Native corporations from mineral leasing to avoid potential encumbrances prior to conveyance. Decisions made within the Ring of Fire Resource Management Plan/Environmental Impact Statement to "open" areas for mineral exploration or development would not go into effect unless lands are retained long-term in federal ownership;
- All areas open to mineral leasing would be open to geophysical exploration, except those lands containing No Surface Occupancy (NSO) restrictions, which would only be available for geophysical exploration in winter conditions, and would be subject to stipulations and through Casual Use as described under 43 CFR 3150.05(b) during non-winter conditions.
- Geothermal resources would be available for leasing in areas open to oil and gas leasing. Areas closed to oil and gas leasing would also be closed to geothermal leasing.
- All leases will be subject to Required Operating Procedures, Stipulations, and Standard Lease Terms as described in Appendix D of the Ring of Fire Resource Management Plan.

11.1.3 SCOPE OF ANALYSIS AND APPROACH

This lease-specific analysis incorporates by reference the programmatic analysis presented in Volume I. This analysis examines the cluster of three pending lease application sites, describes the Reasonably Foreseeable Development scenario for this cluster, examines the existing environmental setting, and describes the potential direct, indirect, and cumulative impacts that lease issuance and anticipated actions following lease issuance at these sites would have on the human and natural environment.

This report focuses on specific key resource concerns in the lease area, and incorporates by reference the impacts described in the PEIS. Decision makers should consider both the impacts described in this lease-specific analysis, in addition to those described in the main body of the PEIS. The analysis presented here does not reiterate the details of impacts identified in the PEIS, but rather refers to them as they arise in the impact analysis for pending lease application sites addressed here. Tongass NF staff members were contacted during the preparation of this analysis to help identify local resource concerns.

11.1.4 CUMULATIVE ACTIONS

One identified cumulative project has been identified within the Bell Island area.

Swan Lake to Tyee Lake Electrical Intertie

The Swan Lake to Tyee Lake Intertie, the first leg of the larger Southeast Alaska power grid, is under construction and will pass through Bell Island. The intertie is projected to reduce the dependence on diesel fuel, reducing air emissions and the risk of fuel spills. The reliable energy that the intertie will bring is expected to attract new economic opportunities to the communities of Southeast Alaska. As of April 2008, trees have been felled on Bell Island for the intertie right-of-way and the merchantable sawlog volume has been removed. The transmission line is projected to be complete and operational by autumn 2009 (Kolund 2008; US Forest Service 2008a).

This Page Intentionally Left Blank

SECTION 11.2
PROPOSED ACTION AND ALTERNATIVES

11.2.1 INTRODUCTION

This chapter provides the details of the proposed action, alternatives to the proposed action, and an overview of the reasonably foreseeable develop (Reasonably Foreseeable Development) scenario for pending lease application sites AK 084543, 084544, and 084545.

11.2.2 PROPOSED ACTION

The proposed action is for the FS to provide a consent determination to the BLM to issue the three leases in the Tongass NF and for the BLM to issue the leases to the geothermal lease applicant. The 7,680 acres of land are spread across nine miles, encompassing most of Bell Island as well as a portion of the adjacent mainland. Bell Island is located near the southeastern end of the Alaskan Panhandle, approximately 43 miles north of Ketchikan (see Figure 1). Lease boundaries could be adjusted in the decision to avoid unacceptable impacts on sensitive resources.

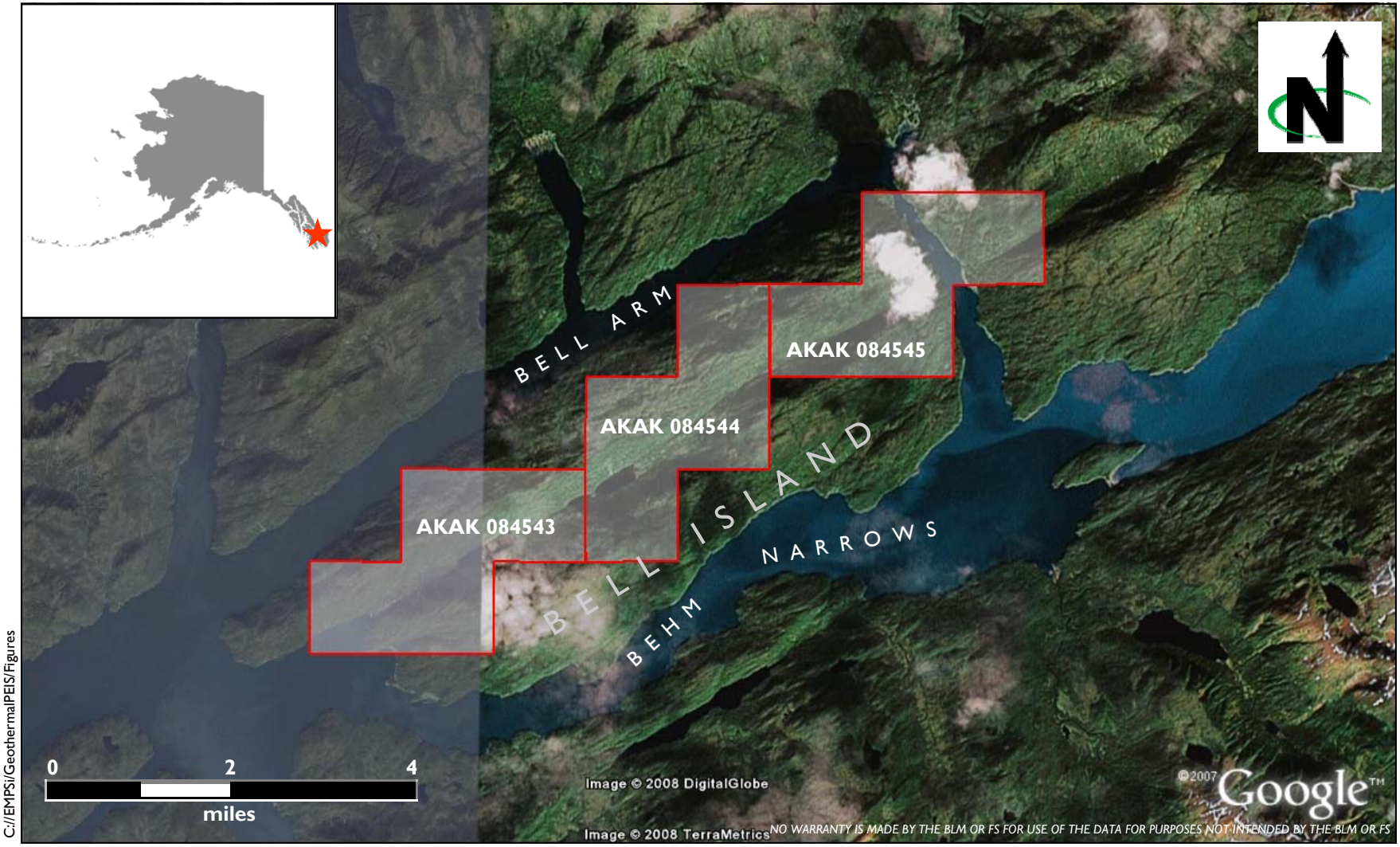
Lease AK 084543

AK 084543 includes approximately 2,560 acres, comprised of four contiguous sections, as follows:

- T68S R89E S36
- T68S 90E S31, S30, S29

Section 36 comprised of approximately two thirds land (Bell Island) and one third ocean waters. The section contains the lower portion of Bell Island Hot Springs, a Seaplane Ramp, and ranges in elevation from sea level to 1,500 feet.

Section 31 is comprised largely of Bell Island, with the upper portion of Bell Island Hot Springs, a creek that flows by and collects water from the hot springs, a portion of a lake higher up that feeds that creek, and a separate creek



C://EMPSi/GeothermalPEIS/Figures

All three sites are on NFS land.

LEGEND:

Lease site boundary

Tongass Lease Locations

AKAK 084543, 084544, 084545

Tongass NF / Anchorage District

Figure 11-1

on the southwestern portion of the section. The lake mentioned here is one of a series of connected Bell Island Lakes, and is at an elevation of approximately 200 feet above mean sea level. Section 31 ranges in elevation from sea level at the southwest corner of the section, to nearly 1,900 feet above mean sea level at the central-eastern edge of the section.

Section 30 is comprised largely of Bell Island, with the northwest corner being marine waters, and the southeastern corner being the aforementioned lake. Elevation ranges from sea level to 1,600 feet. There are no developed uses in this section.

Section 29 contains no developed uses. It contains portions of the lower two Bell Island Lakes, and ranges in elevation from 200 feet above mean sea level at the lakeshore of the lower lake, to 1,900 feet at the southeastern corner. A creek connects the two lakes.

Lease AK 084544

AK 084544 includes approximately 2,560 acres, comprised of the following four contiguous sections: T68S 90E S15, S21, S22, and S28.

Section 15 is comprised largely of land (Bell Island) with a small portion of marine waters (Bell Arm) in the northeast corner, two isolated bodies of water in the northeast quarter section, and a small lake in the southeast quarter section that drains to the other Bell Island Lakes. The section ranges from sea level to 2,235 feet above mean sea level at a peak in the southwest quarter section. The isolated water bodies are at elevations of 1,300 and 1,600 feet. The water body that is connected to the Bell Island Lakes is at an elevation of 1,100 feet. There are no developed uses in this section.

Section 21 is comprised largely of land, with a series of surface freshwater bodies that include several isolated ponds, a portion of one of the Bell Island Lakes, and two creeks that run into that lake. The elevation of Section 21 ranges from 300 feet above mean sea level at one of the Bell Island Lakes in the southern portion of the section, to 1,400 feet above mean sea level in the central portion of the section. There are no developed uses in this section.

Section 22 is comprised largely of land (Bell Island) with two isolated water bodies at elevations of 1,200 feet and 1,600 feet, and two creeks. The section ranges from 500 feet above mean sea level at the southwestern edge, to 2,200 feet along the northeastern edge. There are no developed uses in this section.

Section 28 is comprised largely of land (Bell Island) with surface water bodies being limited to portions of two of the Bell Island Lakes and a creek that connects them. Elevations range from 300 feet above mean sea level at one of the Bell Island Lakes in the northeastern portion of the section, to 2,067 feet at

a peak in the southwest quarter section. There are no developed uses in this section.

Lease AK 084545

AK 084544 includes approximately 2,560 acres, comprised of the following four contiguous sections:

- T68S 90E S12, S13, S14
- T68S 91E S7

Section 12 is comprised of approximately 75 percent land, most of which is Bell Island and a small portion of which is mainland in the northeast quarter section, and 25 percent marine waters, Anchor Pass, separating Bell Island from the mainland. There are no other surface water bodies within this section. The section ranges from sea level to 2,200 feet above mean sea level on Bell Island, and 1,800 feet on the mainland. There are no developed uses in this section.

Section 13 is comprised almost completely of land (Bell Island), with only the extreme northeast corner including a portion of the waters of Anchor Pass. The only other surface water body on the section is a creek that traverses the northeast quarter section. The elevation of Section 13 ranges in elevation from sea level to 2,200 feet at the southwestern corner. There are no developed uses in this section.

Section 14 is comprised entirely of land (Bell Island) with one isolated pond at an elevation of 1,300 feet, two creeks flowing out of the section to the east and to the west, and a small body of water that forms the upper portion of the Bell Island Lakes. The latter water body is located on the southwestern corner of Section 14 and is partially fed by the western creek. The section ranges from 1,100 feet above mean sea level to 2,521 feet at a peak in the central northern portion of the section. There are no developed uses in this section.

Section 7 is comprised largely of land (Alaska mainland) with the southwestern half of the southwestern quarter section containing waters of Anchor Arm. The only other surface water body is a creek that enters the section on the eastern side and empties into Anchor Arm in the southwestern quarter section. Elevations range from sea level to 1,800 feet above mean sea level in the northeastern corner of the section. There are no developed uses in this section.

11.2.3 ALTERNATIVES

Two alternatives are considered in this lease-specific analysis: Alternative A, the No Action alternative, and Alternative B, Leasing with Stipulations.

Alternative A: No Action

Under Alternative A, the FS would not issue a consent determination for any of the lease applications.

Alternative B: Leasing with Stipulations

Under Alternative B, the FS would issue a consent determination for the lease applications, and the BLM would issue the leases with the stipulations identified in Chapter 2 of the PEIS.

11.2.4 REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

It is anticipated that the lease area would be developed for a single, 20 megawatt binary power plant. The power plant would provide electricity to Bell Island Hot Springs, possibly to the Yes Bay Lodge, via underwater cable, and to the Swan Lake to Tyee Lake Electrical Intertie, contributing to the electricity supply for the City of Ketchikan. Yes Bay Lodge is in Yes Bay, approximately 8.5 miles west of the lease area. The electrical intertie would cross Bell Island and is expected to be operational by autumn 2009. Bell Island Hot Springs and the Yes Bay Lodge both currently operate on gas/diesel-powered electrical generators.

Exploration activities for a 20 megawatt plant is expected to involve approximately 6 temperature gradient holes, disturbing approximately 0.15 acre each, for a total disturbance of approximately 1 acre. Disturbance would result from the types of activities described under Chapter 2 of the PEIS under *Phase One: Geothermal Resource Exploration*.

Assuming that a commercially viable resource is found within the lease area, drilling operations and development of the site would be expected to result in a further approximately three acres of land disturbance from the types of activities described in the Reasonably Foreseeable Development scenario of Chapter 2 of the PEIS under *Phase Two: Drilling Operations*.

Utilization, the third phase of a geothermal project, is expected to result in a further approximately six acres of land disturbance from the types of activities described in the Reasonably Foreseeable Development scenario of Chapter 2 of the PEIS under *Phase Three: Utilization*. The length and alignment of transmission lines are not estimated here since these factors would depend upon the positioning of any power plant and the distance to the nearest electrical tie-in, which in this case would be the Swan Lake to Tyee Lake Electrical Intertie.

Reclamation and abandonment, the fourth phase of a geothermal project, is expected to result in temporary disturbance of all originally disturbed acres, after which, the site would graded and vegetated to pre-disturbance conditions, as described in the Reasonably Foreseeable Development scenario of Chapter 2 of the PEIS under *Phase Four: Reclamation and Abandonment*. The connection to the Swan Lake to Tyee Lake Electrical Intertie would be removed, as would the

underwater cable to Yes Bay Lodge, should that connection be made in the first place.

SECTION 11.3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

11.3.1 INTRODUCTION AND GEOGRAPHIC SETTING

The following resource disciplines are not addressed in this section because they are not found in the leasing areas and are not relevant to the discussion: floodplains, unique or prime farmlands, wild horses and burros, special designations, wild and scenic rivers, livestock grazing, designated wilderness, historic and scenic trails.

All the pending lease applications are in geologic units that would be expected to have a relatively low potential for containing vertebrate fossils or scientifically significant invertebrate or plant fossils; therefore, paleontological resources are not analyzed in detail. Paleontological mitigative procedures outline in the PEIS would be followed for all ground distributing activities. Protective measures outlined in the PEIS would be applied.

Future development of the proposed lease sites would also yield the same health and safety impacts as identified in Chapter 4 of Volume I of the PEIS and therefore is not repeated in this lease-specific analysis.

11.3.2 LAND USE AND RECREATION

Setting

This section is a discussion of the current land ownership and use within the Region of Influence (ROI) for the three lease sites that are part of the proposed action. The ROI is the land area within and adjacent to the potential lease sites.

Policies and Plans

It is the policy of the Department of the Interior, consistent with Section 2 of the MMPA and Sections 102(a) (7), (8) and (12) of FLPMA, to encourage the development of mineral resources, including geothermal resources, on federal lands. The Geothermal Steam Act of 1970 provides regulatory guidance for geothermal leasing by the BLM.

The Tongass National Forest Land and Resource Management Plan (US Forest Service 2008b) provides general standards and guidelines for minerals. On NFS lands open to mineral entry, the exploration, development and extraction of leasable minerals in encouraged. In addition, the Ring of Fire Resource Management Plan provides direction for mineral leasing on BLM land and BLM-administered subsurface estate in the Alaska Panhandle and Southwest Alaska. The goal outlined in this plan is to maintain or enhance opportunities for mineral exploration and development while maintaining other resource values (Bureau of Land Management 2008). Geothermal development is consistent with these plans.

Regional Setting

The lease areas are located on and near Bell Island in the Tongass NF in the south-eastern Alaskan Panhandle. The 7,680 acres of land are spread across over nine miles, encompassing most of Bell Island as well as a portion of the adjacent mainland. Lands within and adjacent to potential lease areas are owned or administered primarily by the Tongass NF.

There are no designated recreation areas in the lease area. Bell Island Hot Springs is located within the lease area, but is not open to the public. The applicant for the geothermal lease is the owner of the hot springs.

The closest recreational facility to the lease area is Anchor Arm Cabin, located 1.2 miles to the northeast of AK 084543 along the eastern shore of Anchor Arm. The cabin is separated from the lease area by a stretch of water (Bell Arm/Behm Narrows) and an approximately 1,000 foot rise in topography.

Dispersed recreation occurs through the Tongass NF. Popular activities include camping, fishing, kayaking, hunting and wildlife viewing. Due to lack of access to the project area, visitor use is minimal. A former trail that existed on Bell Island is no longer in use and has been abandoned. Bell Island Hot Springs occurs on the western end of the island, but is not open for public use (Kolund 2008).

The nearest population centers are Ketchikan, approximately 43 miles south of the lease area, and Thorne Bay, approximately 46 miles south-west.

Lease Areas

The lease area is classified as semi-remote recreation under the Forest Plan. Lands under the semi-remote recreation classification are intended for semi-primitive recreational use and may include some development. These lands are open to mineral entry including leasable minerals, provided that specific management practices are applied.

Lease AK 084543
This lease site is comprised of approximately 2,500 acres and includes land on Bell Island and ocean waters. Bell Island Hot Springs lies on sections 31 and 36. The only other developed use is a Seaplane ramp in Section 36.

Lease AK 084544
This lease site contains approximately 2,560 acres, comprised of four contiguous sections. There are no developed uses in the lease site.

Lease AK 084545
Lease AK 084544 includes approximately 2,560 acres, comprised of the four contiguous sections. There are no developed uses in this lease site.

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on existing land uses, including existing recreational uses and would not conflict with the Forest Plan.

Alternative B (Proposed Action)

The Proposed Action would not cause any direct impacts on land use or recreation; however, the anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Based on the Reasonably Foreseeable Development Scenario, it is likely that one plant of 20 megawatts will be developed in the lease area. The impacts of a 50 megawatt plant on land uses are discussed in general terms in Section 4 of the PEIS, under *Land Use, Recreation, and Special Designations*.

Impacts on Bell Island Hot Springs are not of concern since the springs are not open to the public, and the geothermal lease applicant is also the owner of the springs. Noise and visual impacts on Anchor Arm Cabin are unlikely due to its distance and topographical separation from the lease area.

There is potential for the development of a geothermal power plant to impact the remote recreational experience currently available in the area; however, due to the minimal usage of the area, impacts on land use are likely to be minimal. If development of a geothermal facility were to improve access to Bell Island, the Proposed Action could result increased recreational opportunities.

The Proposed Action would be consistent with the Forest Plan and current land management classification provided that lease stipulations outlined in Chapter 2 of the PEIS are followed.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on land use, recreation, or special designations in the lease area; however, anticipated future actions following leasing could contribute to cumulative land use impacts in the

Bell Island area. In combination with the Swan Lake to Tyee Lake Electrical Intertie, development of the lease sites on Bell Island would cumulatively contribute to the trend in land use change on Bell Island from undisturbed conditions to developed condition, including industrial uses. No cumulative impacts on recreation or special designations are expected to result, since recreational use of Bell Island is negligible and there are no areas with special designations in the vicinity.

11.3.3 GEOLOGIC RESOURCES AND SEISMICITY

Setting

The pending lease sites lie within the Pacific Mountain System portion of the Pacific geological province, which extends from southern California through the Kenai Fjords of Alaska. The Pacific province is one of the most geologically young and tectonically active regions in North America. The region straddles the boundaries between several tectonic plates, including the Juan de Fuca, and North American plates (US Geological Survey 2004). Alaska has a complex geology with a mosaic of geologic terranes (pieces the Earth's crust), where each terrane's geologic history is different than that of adjacent terranes. All the terranes in Alaska represent blocks of the earth's crust that have moved large or small distances relative to each other. The movement might have been lateral movement with or without any rotation. Some of the terranes may have moved only a short distance, whereas others may have moved laterally for several hundreds of miles or rotated as much as 135 degrees. The pattern of Alaska terranes reflects the interactions of oceanic crustal plates with the North American plate. Large-scale lateral and rotational movements, rifting, and volcanic activity result from these interactions.

A faultline bisects the island lengthwise. In addition the Queen Charlotte-Fairweather fault runs parallel to the coastal region of the Alaskan panhandle, approximately 100 miles west of the lease area. This fault presents the greatest earthquake hazard to southeast Alaska (US Geological Survey 2003).

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on geological resources, and would not put any people or structures at risk from seismic-related events.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impacts on geologic resources or put people or structures at risk from seismic events; however, the geothermal development activities likely to follow leasing would potentially result in impacts related to inducing seismic events and putting people and structures at risk from seismic events.

Issuing leases for the pending lease sites could indirectly result in the development of geothermal resources at the sites, including increased human presence on the site, and construction of facilities, infrastructure, and transmission lines. Injection of water into a geothermal reservoir during the utilization phase of development could induce seismic activity in the project area. Seismic activity, be it naturally occurring or as a result of injection, could cause damage to structures constructed within the lease site and could cause injury to people within or adjacent to the structures. A seismic event on or near Bell Island could also impact the Swan Lake to Tyee Lake Intertie and, depending on which standards the intertie is designed to meet, potentially could affect electricity transmission to Ketchikan, should the intertie sustain substantial damage. A seismic event on or near Bell Island could also result in impacts on nearby structures such as the Bell Island Hot Springs facility and Yes Bay Lodge.

Potential impacts on any installed geothermal power plant and ancillary facilities would be reduced through implementing the best management practices included in Appendix D under *Geologic Resources and Seismic Setting*.

Prior to allowing injection of fluids into a geothermal reservoir in the lease areas, the FS should consult with the City of Ketchikan regarding potential impacts on the Swan Lake to Tyee Lake Intertie. Project-specific environmental compliance shall consider the seismic safety standards to which the intertie was constructed.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on geologic resources and seismicity in the lease area. Since no projects have been identified in the lease area that would contribute to impacts on geologic resources and seismicity, future actions anticipated to occur following leasing would not cause cumulative impacts in the Bell Island area.

11.3.4 ENERGY AND MINERALS

Setting

The Ketchikan Public Utilities is the largest energy provider in the region. Ketchikan Public Utilities produces and consumes all of the electricity it generates. Sales in 2003 totaled 145,120,668 kWh (Ketchikan Public Utilities 2004).

Ketchikan Public Utilities owns or operates a number of hydro power plants including Ketchikan Lakes Hydro, Beaver Falls Hydro, and Silvis Hydro and Swan Lake Hydro. Total hydro capacity is about 34 megawatts. Construction is underway for additional transmission lines to connect existing hydro plants with additional communities. The Swan Lake to Tyee Lake Intertie is under construction, which would connect Ketchikan's Swan Lake hydroelectric facility

with the Tyee Lake facility serving Wrangell and Petersburg. This intertie is the first component of the plan to connect all of the communities in Southwest Alaska within a single power grid (Ketchikan Public Utilities 2004).

The potential for leasable minerals including oil and gas has been determined to be low for the leasing area. No leasable minerals are currently produced on the Tongass NF. Geothermal resources occur in 19 known locations in Southeast Alaska, but development of these resources has been minimal (US Forest Service 2008b)

The Southeast Alaska region has a long history of mineral prospecting and mining. Mining remained active from the late 1800s until WWII. Prospecting and exploration increased again during the mid-1970's, due to additional discoveries as well as advances in technology advances. Due to the continued high prices of gold and other minerals, mining is expected to continue in the area. No mineral activity tracks have been identified in the leasing area. A wide variety of mineral deposit types and mineral resources are found within the Tongass National Forest. Some of these include gold, silver, molybdenum, and uranium, and lead, zinc, copper, tungsten and platinum (US Forest Service 2008b).

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on energy and mineral resources.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on energy or mineral resources; however, the geothermal development activities likely to follow leasing would likely result in the use of a currently unused geothermal resource and would contribute a renewable form of energy to the City of Ketchikan and other local users. Details on the impacts of geothermal leasing for a standard 50-megawatt plant are included in Section 4.4, *Energy and Mineral Resources*. There would be no other impacts on energy or minerals.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on energy and minerals; however, the geothermal development activities likely to follow leasing could contribute to cumulative energy and mineral impacts in the Alaskan Panhandle. Development of the lease sites in combination with the Swan Lake to Tyee Lake Electrical Intertie project would cumulatively improve the regional, locally-generated and renewable electricity supply. Since the intertie project would not affect mineral or geothermal resources, no cumulative impacts on mineral resources are expected.

11.3.5 SOILS

Setting

AK 084543

Soils in the western section of this lease site are dominated by McGilvery-Lithic Humicryods association at high slopes (75 to 100 percent) and Lithic Cryohemist, Cryosaprist, and Staney soils at low slopes (zero to 35 percent). Eastern sections are composed of McGilvery-Lithic Humicryods association, Histosols and shallow-Calamity-Rock Outcrop associations, with typical slopes of 35 to 75 percent. McGilvery and Cryosaprist soils comprise the central and southern portions of the lease site, at steep slopes of 75 to 100 percent (Silkworth 2008).

AK 084544

Soils in the western section of this lease site are dominated by McGilvery-Lithic Humicryods association, and Lithic Cryohemist, Cryosaprist, and Staney soils at low slopes. McGilvery and Cryosaprist soils dominate the eastern portion of the site. McGilvery-Lithic Humicryods association, Histosols and shallow-Calamity-Rock Outcrop associations, and Lithic Cryohemist, Cryosaprist, and Staney soils comprise the central and southern portions of the lease site. Many small sources of fresh water are also found throughout this site (Silkworth 2008).

AK 084545

Soils at this lease site are dominated by McGilvery and Cryoprist soils in the west and east. Lithic Cryohemists, Cryosaprists and Stanley soils, McGilvery-Lithic Humicrods association, Histosols, and shallow-Calamity-Rock Outcrop associations comprise the central and southern regions (Silkworth 2008). Many small sources of fresh water are also found throughout this site.

There are no prime or unique farmlands within any of the lease sites.

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on soils.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on soils; however, anticipated ground disturbance from the geothermal exploration and development activities likely to follow leasing would potentially result in impacts on erosion and soil productivity.

Prior to construction of any facilities or infrastructure, geotechnical investigations would need to be conducted to ensure that any construction be situated on stable soils, and that erosion-prevention measures be implemented in accordance with permitting requirements. Also, project-specific proposals

would undergo an evaluation to determine whether proposed ground-disturbing activities are within regional Soil Quality Standards.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on soils in the lease area; however, anticipated future actions associated with development of geothermal resources could contribute to cumulative soil impacts in the Bell Island area. This development could contribute to cumulative soil erosion impacts in the Bell Island area that are also expected to be resulting from timber harvesting and ground disturbance from the Swan Lake to Tyee Lake Electrical Intertie Project. Stormwater and erosion prevention measures outlined in Chapter 2 (lease stipulations) and Appendix D (best management practices) of the PEIS would reduce these cumulative impacts.

11.3.6 WATER RESOURCES

Setting

Surface Water

Bell Island is within the Alaska Southeast hydrologic unit, an area spanning the Alaskan Panhandle. Surface water in Alaska is managed by the Alaska Department of Natural Resources, Division of Mining, Land and Water, Water Resources Program (Alaska Department of Natural Resources 2008). At this time the majority of water in the state has not been assessed or inventoried (US Environmental Protection Agency 2008).

Surface water features at the lease sites are small ponds and lakes concentrated in the north-central region of Bell Island. Three lakes lie along a fault line that runs through the center of the island. These lakes are connected by a stream that empties into the ocean at the southwestern tip of the island (Huette 2008). Bell Island Hot Springs is located on that same tip of the island and has about a discharge rate of about 100 gallons per minute and a temperature of about 70 degrees Celsius (Motyka et al. 1980).

No research is currently available regarding water quality within the lease sites. Due to the undeveloped nature of Bell Island, surface water resources are expected to be pristine, with little to no contamination.

Ground Water

The aquifers of Alaska have never been mapped, except in the immediate vicinity of some of the towns and cities. Igneous, metamorphic, and sedimentary rocks underlie approximately 70 percent of the state. These rocks generally yield smaller amounts of water to wells than coarse-grained alluvial and outwash deposits. Carbonate bedrock on some islands in southeastern Alaska yields large quantities of water from well-developed cave systems. In general, the water-yielding capacity of bedrock in Alaska is not well known. Several coarse-grains

Quaternary deposits that may locally comprise aquifers are found within the region of the lease site, however none are know to occur within or immediately adjacent to the site (US Geological Survey 1994).

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on water resources.

Alternative B (Proposed Action)

Water Quality

The Proposed Action would not have any direct impact on water quality; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in impacts on water quality. Typical impacts on water quality from geothermal development are described in Section 4.7, *Water Resources*. Best management practices for water resources, included in Appendix D, would reduce impacts on water quality.

Water Quantity

The Proposed Action would not have any direct impact on water quantity; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in impacts on water quantity, since indirect use geothermal projects require large amounts of water during all phases of a project from exploration through reclamation and abandonment. Both groundwater and surface waters are abundant in the lease area, and no impacts on existing water resources are expected.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on water quality or quantity in the lease area; however, anticipated future actions associated with development of geothermal resources could contribute to cumulative water quality impacts in the Bell Island area. Geothermal development activities, combined with surface activities associated with the intertie project, could cumulatively impact surface water quality through ground disturbance, discharges of geothermal fluids, and stormwater runoff. Groundwater quality could be cumulatively impacted through on-site spills of petroleum products and other chemicals used during construction and maintenance of facilities, as well as from discharges of geothermal fluids to the surface. Lease stipulations (Chapter 2) and best management practices (Appendix D) of the PEIS would reduce these potential cumulative impacts.

11.3.7 AIR QUALITY AND ATMOSPHERIC VALUES

Setting

The lease area is located in Ketchikan Gateway Borough, an area with air quality status of Unclassified. Due to the remote location of the lease sites, air quality is considered to be good.

The lease site is within a maritime climate zone that includes southeastern Alaska, the south coast, and southwestern islands. The closest weather monitoring station to the lease site is at Ketchikan, Alaska, approximately 43 miles south of the lease area. The coastal mountain range coupled with plentiful moisture produces annual average precipitation amounts of approximately 150 inches at Ketchikan. Average maximum temperatures at Ketchikan range from 38.9 degrees Fahrenheit in January, to 65.0 degrees Fahrenheit in August, with average minimum temperatures ranging from 28.4 degrees Fahrenheit in January, to 51.6 degrees Fahrenheit in August (Western Regional Climate Center 2007).

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on air quality or atmospheric values.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on air quality or atmospheric values; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Geothermal exploration and development activities would result in fugitive dust and exhaust from combustion engines, but these emissions would not result in violations of ambient air quality standards given the Unclassified status of the borough and the good level of existing air quality.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on air quality and atmospheric values in the lease area. Construction of the intertie project is expected to be complete prior to any geothermal development activities, and the intertie project is not expected to result in any ongoing air emissions; therefore, no cumulative air quality and atmospheric values impacts are expected from anticipated future activities following leasing.

11.3.8 VEGETATION

Setting

There are three lease application sites that occur on NFS lands, covering the majority of Bell Island. Bell Island is located within coastal forest of southeast Alaska; a cool temperate rainforest that extends along the Pacific coast from

northern California to Cook Inlet in Alaska. Lands within the lease sites rise from approximately 300 feet elevation to 2,235 feet. The natural plant communities in the lease area is dominated by old-growth conifers; primarily western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sithcensis*), with a scattering of mountain hemlock (*Tsuga mertensiana*), western redcedar (*Thuja plicata*), and Alaska yellow cedar (*Callitropsis nootkatensis*). Blueberry (*Vaccinium sp.*), Sitka alder (*Alnus viridis ssp. sinuata*), Devil's club (*Oplopanax horridus*), and salal (*Gaultheria shallon*) are common shrubs in the lease area and throughout the Tongass National Forest. Other understory species include dogwood (family *Cornaceae*), single delight (*Moneses uniflora*), and skunk cabbage (*Lysichiton americanus*). Because of the high rainfall and resulting high humidity, mosses grow in great profusion on the ground, on fallen logs, on the lower branches of trees, and in forest openings. Muskeg (bog plant) communities, dominated by sphagnum mosses and sedges, occur on flat areas of Bell Island (Huette 2008).

Invasive Species

Invasive species are considered to be plants that have been introduced into an environment where they did not evolve (Bureau of Land Management 2008). Invasive species can have dramatic impacts on the natural ecosystem by reducing habitat for native vegetation, as well as, altering forage and wildlife habitat. Invasive species reduce the productivity of healthy rangelands, forestlands, riparian areas, and wetlands. Eradication of these species is intensive, time consuming, and costly.

Alaska is just beginning to document and address problems associated with invasive plants. Recent surveys by the Alaska Cooperative Extension Service, Alaska Department of Natural Resources, BLM, US Fish and Wildlife Service, National Park Service, and the US Forest Service show that more non-native plants occur in the state than previously thought, but population size is still relatively manageable. Common invasive species include reed canarygrass (*Phalaris arundinacea*), spotted knapweed (*Centaurea biebersteinii*), orange hawkweed (*Hieracium aurantiacum*), white sweet clover (*Melilotus alba*), and bull thistle (*Cirsium vulgare*). Invasive plant problems are being addressed on the Tongass National Forest via recently signed invasive plant management plans (US Forest Service 2006a). Records of invasive plant surveys within the lease were not available.

Special Status Species

There are no federally listed or proposed threatened or endangered plants that are expected on Bell Island (US Forest Service 2006b, Huette 2008).

Old-Growth Forests

Old growth is characterized by a patchy, multi-layered canopy; trees that represent many age classes; large trees that dominate the overstory, standing dead (snags) or decadent trees; and higher accumulations of down woody material. The structure and function of an old-growth ecosystem will be

influenced by stand size, landscape position, and juxtaposition with other elements of the landscape (Huette 2008).

Medium and high volume productive old growth forest is concentrated along the coast of Bell Island and the neighboring mainland. A corridor of medium and high volume productive old growth runs lengthwise through the island (Huette 2008).

Wetlands/Riparian Areas

With the exception of old-growth areas, the majority of Bell Island is wetland. Interior areas are dominated by freshwater emergent wetland, giving way to a freshwater forested/shrub wetland that continues up to forest edges. Adjacent mainland coastal areas are characteristically similar. Two lakes lie in the center of the island within lease sites AK 084543 and 084544, connected by a stream that runs lengthwise towards the western tip of the island and emptying into the ocean. Two freshwater ponds occur within lease sites AK 084544 and 084545 (US Fish and Wildlife Service 2008c).

Impacts

Potential impacts on vegetation and important habitats could occur if reasonably foreseeable future actions were to:

- Affect a plant species, habitat, or natural community recognized for ecological, scientific, recreational, or commercial importance;
- Affect a species, habitat, or natural community that is specifically recognized as biologically significant in local, state, or federal policies, statutes or regulations;
- Establish or increase of noxious weed populations;
- Destroy or extensively alter habitats or vegetation communities in such a way that would render them unfavorable to native species; or
- Conflict with BLM or FS management strategies.

Alternative A (No Action)

The No Action alternative would have no impact on vegetation or important habitats.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on vegetation or important habitats or communities; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in impacts associated with the elimination and degradation of habitat. Geothermal exploration and development activities can cause the following stressors and associated impacts on vegetation and important habitats:

- Habitat disturbance – Site clearing, well drilling, construction of access roads and geothermal facilities, as well as maintenance and operational activities would disturb habitat which would cause mortality and injury, increased risk of invasive species, and alter water and seed dispersion, as well as wildlife use, which can further affect vegetation communities.
- Direct Removal and Injury – Vegetation would be cleared for roadways, vehicle staging, buildings, pipelines, and transmission lines. All merchantable sawlog and utility grade logs would be purchased and paid for by the permittee from USDA Forest Service Region 10 under a timber settlement agreement prior to felling any merchantable trees. Activities could result in loss of soil, loss of seed bank in soil, deposition of dust, and destruction of biological soil crusts. Maintenance around project components, such as drill pads, buildings, pipelines, or other facilities would involve mowing, herbicide treatment, and other mechanical or chemical means of removal and control. This would result in a net loss of important habitats and communities throughout the planning area.
- Invasive Vegetation – Disturbance and access by vehicles and human foot traffic may expose areas to colonization by invasive and non-native species, making it more difficult for endemic species to reestablish in disturbed areas and threatening the continued existence of endemic species (Bureau of Land Management 2007).
- Fire – Increased vehicular and human traffic, operation of equipment, the use of drilling muds, and the extraction of geothermal fluids can increase the risk of fires. Vehicles, electrical lines, and cigarette smoking can all result in accidental fires. Fires destroy vegetation and can aid in the establishment of invasive species.
- Erosion – Site clearing, grading, construction of access roads, containment basins, site runoff and vehicle and human foot traffic cause erosion. The effects of erosion include the removal of top soil, loss of seed bank, loss of native vegetation, the establishment of invasive species, the sedimentation of streams, and flooding (which can directly result in affects to riparian vegetation and riparian habitats).
- Exposure to Contaminants – Vehicle fuel, hydraulic fluid, solvents, cleaners, and geothermal fluids can all be harmful to vegetation and important habitats. Accidental spills can contaminate soils and water and directly harm vegetation. Licensed herbicide use would likely be used to control vegetation around geothermal facilities and support structures. Spills of herbicides or acute exposure to herbicides can have adverse affects on non-target vegetation.

Table 3.9-1 in Section 3.9 of Volume I of the PEIS provides a breakdown of the likelihood for impacts to occur during each phase of geothermal development (exploration, drilling operations and development, utilization, and reclamation and abandonment).

Riparian and Wetland Habitat

Both freshwater emergent and freshwater forest/shrub wetlands lie within the lease area and may be affected by anticipated future activities following leasing. The construction of roadways, drill pads, facility foundations and other support structures may require the conversion and fill of wetlands. These actions can cause impacts on hydrology, water quality, soil productivity, and fish and wildlife habitats. Chapter 4 of the PEIS provides more specific detail on the potential impacts on wetland habitats associated with geothermal activities.

Impacts on wetlands are regulated under the River and Harbors Act and Section 404 of the Clean Water Act. Permitting from the U.S. Army Corps of Engineers (Corp) would be required if future development at the site would have any impact to wetlands under Corps' jurisdiction. In addition, E.O. 11990, "Protection of Wetlands," requires all federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on vegetation and important habitats in the lease area; however, anticipated future actions associated with development of geothermal resources could contribute to cumulative impacts on vegetation and important habitats in the Bell Island area. In combination with the Swan Lake to Tyee Lake Electrical Intertie, development of the lease sites on Bell Island would cumulatively contribute to loss in vegetation and important habitats, and increased impacts on wetlands and riparian habitat.

11.3.9 FISH AND WILDLIFE

Setting

There are over 300 vertebrate species that inhabit the Tongass National Forest at some point in their life cycle, including 231 birds, 54 mammals, and 5 species of amphibians and reptiles (Silkworth 2008). Common species include Sitka black-tailed deer, (*Odocoilues hemionus sitkensis*), brown bear (*Ursus arctos*), American marten (*Martes americana*), and red squirrel (*Tamiasciurus hudsonicus*). Noted bird species include the bald eagle (*Haliaeetus leucocephalus*), Queen Charlotte goshawk (*Accipiter gentilis laingi*), common raven (*Corvus corax*), and a variety of coastal shorebirds. The temperate rainforest provides nesting and foraging habitat for a variety of forest species. Twelve types of cavity and bark-nesting birds, including the hairy woodpecker (*Picoides villosus*) and red-breasted

sapsucker (*Sphyrapicus ruber*) occur in the area. Forest- and shrub-nesting species found in the area include flycatchers, forest raptors, crossbills, kinglets, and warblers such as the Townsend's warbler (*Dendroica townsendi*), which favor large spruce trees, such as those found throughout the lease area. The region's wetlands provide habitat for numerous waterfowl. The Pacific Flyway passes through the area and as many as 30 percent of local avian species migrate to the southern US, Central America or South America (US Forest Service 2008c).

Streams on Bell Island and within the lease areas are known to support several salmon species. Fish Pass Feasibility and Habitat Survey of Bell Creek, which is within lease area AKAK 084543, conducted in 2003 recorded the presence of pink (*Oncorhynchus gorbuscha*) and coho salmon (*O. kisutch*). This stream is also a cataloged as an ADG&G anadromous stream (#101-80-10990) supporting coho, chum (*O. keta*), pink, and steelhead (*O. mykiss*). Dolly Varden char (*Salvelinus malma malma*) and cutthroat trout (*Oncorhynchus clarki*), FS management indicator species, also occur in the area and depend of freshwater habitat (Silkworth 2008). Several species of fresh- and salt-water sculpins (*Hemilepodotus sp.*) occur within the area and three-spine stickleback (*Gasterosteus aculeatus*) are common in freshwater lakes in the region (Wipfli 2005).

A total of eight amphibian species are known to exist in Southeast Alaska (MacDonald and Cook 2007). Amphibian populations in throughout Alaska are not well understood because of their limited breeding range and isolated populations. Both rough-skinned newts (*Taricha granulosa*) and western toads (*Bufo boreas*) have been documented on islands adjacent to Bell Island, and wood frog (*Rana sylvatica*), spotted frog (*Rana pretiosa*) and long-toed salamander (*Ambystoma macrodactylum*) populations have been documented on the nearby mainland (US Forest Service 2008b). The major stressor negatively affecting terrestrial wildlife in the area is logging; however, the majority of the Tongass National Forest has been conserved for wilderness and recreational purposes, greatly reducing impact from the timber industry (Silkworth 2008).

Impacts

Impacts on fish and wildlife would occur if reasonably foreseeable future actions were to:

- Adversely affect a population by substantially reducing its numbers, causing a fish or wildlife population to drop below self sustaining levels or causing a substantial loss or disturbance to habitat, such effects could include vehicle impacts and crushing, increased predation, habitat fragmentation, or loss of seasonal habitat;
- Have a substantial adverse impact on nesting migratory birds, including raptors, as protected under the Migratory Bird Treaty Act;
- Interfere with the movement of any resident or migratory fish or wildlife species, or with established native resident or migratory

wildlife corridors, or impede the use of native wildlife nursery sites; or

- Conflict with the wildlife management strategies of the FS.

Alternative A (No Action)

The No Action alternative would have no impact on fish and wildlife.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on fish and wildlife; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts, as described below.

Fish

Fish species in the lease area could be affected by several activities. Impacts on fish and aquatic biota from development in the lease area would be linked to impacts on riparian habitats and immediately adjacent upland habitat. Ground disturbance, vegetation removal, ground water withdrawal, road construction and excavation, installation of structures and other facilities, such as transmission towers or pipelines, and release of water contaminants could affect fish species residing in streams in the project area, such as pink and coho salmon, steelhead trout, and Dolly Varden char. Changes in hydrology, increased turbidity, changes in water quality (temperature, dissolved oxygen, pollutants, etc), loss of riparian vegetation (an indirect aquatic food source), restriction of fish movement and migration, and changes in predator and human use of the aquatic habitat are all potential impacts associated with development of the lease area. The Chapter 4 of Volume I of the PEIS provides a more complete analysis of the potential impacts on fish resulting from geothermal activities, as well as impacts on riparian and wetland habitat that could affect fish and other aquatic biota.

Essential Fish Habitat

The Magnuson-Stevens Fisheries Conservation and Management Act, or Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (PL 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat for species regulated under a federal fisheries management plan. The Magnuson-Stevens Act defines Essential Fish Habitat as those waters and substrate necessary for fish use in spawning, breeding, feeding, or growth to maturity. The Magnuson-Stevens Act requires federal agencies to consult with the National Marine Fisheries Service regarding activities that may adversely affect Essential Fish Habitat. Essential Fish Habitat consultations are intended to determine whether proposed projects would adversely affect designated Essential Fish Habitat and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to Essential Fish Habitat. The implementing regulations for Magnuson-Stevens Act allow for the

integration of NEPA or Endangered Species Act Section 7 reviews with the analysis of proposed project effects on Essential Fish Habitat.

Pursuant to the Magnuson-Stevens Act, the Pacific Fisheries Management Council has designated Essential Fish Habitat for all stocks of Pacific salmon. Freshwater Essential Fish Habitat for salmon includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Alaska. The four major components of Essential Fish Habitat for these species consist of (1) spawning and incubation habitat, (2) juvenile rearing habitat, (3) juvenile migration corridors, and (4) adult migration corridors and adult holding habitat.

Essential Fish Habitat potentially affected by geothermal activities at the lease areas may occur in the streams that pass through or are immediately adjacent to the lease areas, as well as stream estuaries.

Wildlife

Terrestrial wildlife species could be displaced during the removal of habitat or development of geothermal facilities. Small ground dwelling species, such as small mammals, could be crushed by vehicle traffic and clearing activities. Fire can cause direct mortality. Vehicles, cigarette smoking, and power lines can cause wildfires that can kill and displace animal species, especially smaller and less mobile animals. Invasive vegetation introduced during exploration and development activities can alter wildlife habitat, making it less suitable for habitation.

The lease sites provide habitat for a variety of resident and migratory birds. The FS is required to analyze the impacts of any action on migratory birds, under the Migratory Bird Treaty Act. The likelihood of disturbing nests of such birds is limited primarily to breeding and nesting seasons (spring and summer). Lease stipulations to avoid disturbance during the migratory bird nesting season, so as not to violate the Migratory Bird Treaty Act, would reduce the potential for significant impacts on migratory birds. Waterfowl, raptors, and small birds that depend on particular forest types as a source of food or cover could be vulnerable to loss of habitat within the lease area. Removing timber and other vegetative cover could affect foraging and nesting behavior.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on fish and wildlife; however, anticipated future actions associated with development of geothermal resources would contribute to cumulative impacts on fish and wildlife in the Bell Island area. In combination with the Swan Lake to Tyee Lake Electrical Intertie, development of the lease sites on Bell Island and an increased human activity on the lease sites would cumulatively contribute to loss and decreased quality of fish and wildlife habitat.

11.3.10 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES

Setting

This section provides an overview of threatened, endangered, and special status species, and their habitats that may occur in the lease area. Special status species are those identified by federal or state agencies as needing additional management considerations or protection. Federal species are those protected under the ESA and those that are candidates or proposed for listing under the ESA. State sensitive species are those considered sensitive by the Alaska Department of Fish and Game. A list of sensitive species that may occur in the lease area is provided below based on discussion with Forest Service biologists and review of appropriate documents as referenced.

There are no federally listed species known or expected to occur in or immediately adjacent to the lease area. Humpback whales (endangered) and Steller's sea lion (threatened) are likely to occur in the marine waters adjacent to Bell Island, but would not be affected by geothermal activities. Region 10 Forest Service sensitive species with potential to occur on Bell Island include Queen Charlotte goshawk and trumpeter swan (*Cygnus buccinators*). No surveys have been conducted for these species on the island.

Nineteen vascular plants are designated as sensitive in the Alaska Regional Forester's revised Sensitive Plant Species List of June 2002. Plant species included on the list that are known or expected to occur on Bell Island are found in Table 11.3-1 below.

Table 11.3-1
Forest Service Region 10 Sensitive Plant Species
Known or Expected to Occur on Bell Island.

Scientific Name	Common Name	Occurrence
Arnica lessingii ssp norbergii	Norberg arnica	Suspected
Botrychium tunux	Unnamed moonwort	Suspected
Botrychium yaasudakeit	Unnamed moonwort	Suspected
Carex lenticularis	Goose-grass sedge	Known
Glyceria leptostachya	Davy mannagrass	Suspected
Hymenophyllum	Wright filmy fern	Suspected
Isoetes truncate	Truncate quillwort	Suspected
Ligusticum caldera	Calder lovage	Suspected
Platanthera gracilis	Bog orchid	Known
Poa laxiflora	Loose-flowered bluegrass	Suspected
Romanzoffia unalaschencensis	Unalaska mist-maid	Suspected
Senecio moresbiensis	Queen Charlotte butterweed	Known

Source: US Forest Service 2006

Impacts

Impacts on threatened and endangered and special status species would occur if reasonably foreseeable future actions were to:

- Violation the Endangered Species Act, the Migratory Bird Treaty Act, or applicable state laws; or
- Decrease a plant or wildlife species population to below self-sustaining levels.

Alternative A (No Action)

The No Action alternative would have no impact on special status species.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on threatened and endangered and special status species; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Threatened and endangered species (including federal and state listed species and FS special status species) could be affected as a result of (1) habitat disturbance, (2) the introduction of invasive vegetation, (3) injury or mortality, (4) erosion and runoff, (5) fugitive dust, (6) noise, (7) exposure to contaminants, and (8) interference with behavioral activities.

Because of the regulatory requirements of the Endangered Species Act and various state regulations, as well as the requirements specified in BLM Manual 6840 Special Status Species Management and other resource-specific regulations and guidelines, appropriate survey, avoidance, and mitigation measures would be identified and implemented prior to any geothermal activities to avoid adversely affecting any sensitive species or the habitats on which they rely.

Cumulative Impacts

Neither the Proposed Action nor any anticipated future actions associated with development of geothermal resources following leasing would have any cumulative impacts on threatened and endangered and special status species in the lease area, as none are known to exist. Additionally, because of the regulatory requirements of the Endangered Species Act, various state regulations, and other resource-specific regulations and guidelines, appropriate survey, avoidance, and mitigation measures would be identified and implemented prior to any geothermal activities to avoid adversely affecting any sensitive species or the habitats on which they rely.

11.3.11 CULTURAL RESOURCES

Setting

Cultural resources are past and present expressions of human culture and history in the physical environment and include prehistoric and historic

archaeological sites, structures, natural features, and biota that are considered important to a culture, subculture, or community. Cultural resources also include aspects of the physical environment that are a part of traditional lifeways and practices and are associated with community values and institutions.

As in the PEIS, discussions relevant to cultural resources in this document are found in two sections. Traditional cultural resources and traditional cultural properties are addressed in Section 11.3.13, *Tribal Interests and Traditional Cultural Resources*. Cultural resources in this section include the physical remains of prehistoric and historic cultures and activities.

All three leases in Alaska are within the Northwest Coast culture region, as described broadly in the Appendix I of the PEIS. De Laguna (1990) provides an ethnographic overview of the project area within the larger Northwest Coast culture region. The following discussion is based primarily on that overview. The Alaska leases are considered to be within the traditional territory of Southern Tlingit-speaking groups. That area is further broken down into dialects of Tlingit, the lease area being on or near the boundary of the Sanya and Stikine dialects.

As outlined in Appendix I, the earliest people to inhabit this area are referred to as Paleoindian, though there is little archaeological evidence that has been attributed to these populations. However, this may be due to the effects of sea level rise (Bureau of Land Management 2008; Neusius and Gross 2007). The archaeology of later prehistoric and historic periods is better documented due to the number of non-native populations arriving in the region beginning in the 1700s. A common focus for much of Alaskan prehistoric research is early migration from Eurasia into North America along the Pacific coast. A site on Prince of Wales Island to the west of the project area has returned early dates of approximately 9,900 years ago (Bureau of Land Management 2008).

Traditional legends indicate that most Tlingit believe their ancestors first entered the area from the Tsimshian peninsula, while later groups from the interior migrated to this coastal region down rivers. Several population movements occurred in the culture region over time, primarily in response to other population movements. In each Tlingit tribal area there was at least one main village that was occupied in the winter and typically deserted in the summer. These were most often situated on a sheltered bay with a sandy beach and views of the surrounding access routes. Villages were characterized by a row of large wood plank houses facing the water with a cemetery at one end (or on an adjacent island) and relatively easy access to subsistence resources. In the project area tall mortuary totem poles were erected beside or in front of the houses. Shamanistic regalia were stored in boxes in the surrounding woods. Satellite fishing and hunting camps were established and used during the summer. Early springs were spent hunting and trapping terrestrial mammals, and fishing in deep waters and in rivers, and collecting shellfish and seaweed along the coast. During late spring through fall, many people hunted for sea otter and

fur seals. Salmon was caught and cured and vegetal resources were collected during the summer as well. Fishing trips were often made upriver during early spring or late summer, with groups wintering in the interior, and returning downriver the following spring. When rivers were frozen over in the winter, many mainland populations took the opportunity to travel inland for trade. Tlingits primarily traded between "partners" in a system known as the "potlatch" (De Laguna 1990).

A variety of historic-era activities have been documented within the region of the Alaska leases. Alaska was originally explored by the Russians who established political boundaries. The state was later purchased by the U.S. in 1867 (De Laguna 1990; Bureau of Land Management 2008). During the period of Russian occupation Tlingits maintained an independence living away from Russian forts in Sitka and Wrangell, to the northwest and north of the project area respectively. However goods were acquired at the forts although Tlingit canoes were traveling as far south as Puget Sound for the purposes of trade. Following purchase of Alaska by the U.S. Tlingits became increasingly involved in the Euro-American economies (De Laguna 1990). The state became part of the Union in 1959, however settlement between the Tlingit and the U.S. regarding lands taken from the Tlingit was not reached until 1968 (Bureau of Land Management 2008). Throughout this history historic activities of the region have included fur trapping and trade, fish canneries, emigration and settlement by Euro-Americans and Canadians, mineral mining, including the Klondike Gold Rush, trade between Native Americans and Euro-Americans, trail and railroad establishment (De Laguna 1990; Bureau of Land Management 2008).

Data on cultural resources of the proposed lease areas were provided in April 2008 by Martin Stanford, Archaeologist for the Ketchikan-Misty Fiords Ranger District of the Tongass NF. The seven survey reports provided revealed the presence of two previously recorded cultural resources within the lease areas, one within each of AK 084543 and 084545. The entirety of the shoreline within all three leases has been previously surveyed. Surveys of the shorelines in the area have identified numerous rock art sites. The inland portions of the leases have had minimal survey coverage that included portions of the valley that runs the length of Bell Island. The overwhelming majority of the leases have not been previously surveyed.

Bell Island Hot Springs (AK-Ket-007) is within the southeastern portion of AK 08543. A variety of historic-era activities occurred here. A log cabin was constructed in the 1880s by a mink trapper. Later pioneers stopped at this location to soak in the hot springs and by 1899 a dwelling and a bath house had been constructed. As of a 2006 survey, remaining structures from the trapper's cabin and the bath house still remained (Stanford 2006). It appears that this site has not been previously evaluated for National Register of Historic Places (NRHP) eligibility.

The Anchor Pass Stake Weir site (AK-Ket-097) is within the eastern extent of AK 084545. This prehistoric, NRHP-eligible site consists of two sets of four stone piles and a possible "wolf trap" pool located in the intertidal area. One set of the rock piles is described as resembling a dock or mooring for a boat. Subsurface testing in the area revealed no cultural materials (Historical Research Associates, Inc. undated).

Consultation with federally-recognized tribes that are affiliated with the lease area was initiated on September 12, 2007 to identify and assess historic properties that may be affected by the undertaking. No responses from local tribes have been received as of the date of publication; however consultation is considered on-going. Until consultation with local Native Americans has been completed, it is unknown if there are Native American sites or sacred sites within or adjacent to the lease areas. The presence of cultural resources within portions of the leases not previously surveyed is also possible. Table 11.3-2 summarizes available data on the cultural resources of the proposed lease areas.

Table 11.3-2
Cultural Resources in the Proposed Lease Areas

Lease	Surveys (Acres/Percent)	NRHP-listed sites	NRHP-eligible sites	NRHP-ineligible sites	Unevaluated sites
AK 054543	<10%	N/A	N/A	N/A	1
AK 054544	<10%	N/A	N/A	N/A	N/A
AK 054545	<10%	N/A	N/A	N/A	1

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on cultural resources.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on cultural resources; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Completion of the Section 106 process of the National Historic Preservation Act requires the BLM and FS to consult with the State Historic Preservation Office, tribes and other parties to identify and assess historic properties affected by the undertaking and develop measures to avoid, minimize, or mitigate any adverse effects of the undertaking on historic properties.

Given the presence of NRHP-eligible resources and the overall lack of terrestrial surveys within the pending lease sites, indirect and secondary impacts on cultural resources could occur from subsequent permitted geothermal

exploration, drilling operations and development, utilization, and reclamation and abandonment through ground-disturbing activities, unauthorized actions and alterations to setting and cultural landscapes. The nature of these impacts is described in Chapter 4 of Volume I of the PEIS. Additionally, as described in Chapter 2 of Volume I of the PEIS, various areas of cultural resources would have No Surface Occupancy stipulations: National Landmarks, National Register Districts, NRHP-listed and -eligible sites and their associated landscapes, traditional cultural properties, Native American sacred sites, and areas with important cultural and archaeological resources. Areas of potential effect would include access roads, well pads, power plant footprints, pipeline and transmission line routes, and construction staging areas as well as the boundaries of cultural resources those facilities cross and the aspects of setting that contribute to significance. These areas of potential effect would be developed at the project-specific level, and would require inventories, evaluations, and appropriate treatments as outlined in the best management practices of Appendix D in Volume III of the PEIS. Under these cultural resources best management practices, the BLM would also conduct Section 106 consultations with the State Historic Preservation Office, Native American tribes with ties to the project area, and local historic preservation groups to identify the presence and significance of cultural resources within or adjacent to the lease area and assess the level of impact of geothermal exploration and development on those resources. Project-specific impacts from actions following leasing would be reduced by implementing these best management practices.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on cultural resources; however, anticipated future actions associated with development of geothermal resources could cause such impacts. Past ground-disturbing activities and the Swan Lake to Tyee Lake Intertie project undoubtedly have had and will have effects on cultural resources given the regional density of resources and general lack of terrestrial survey coverage. Presumably past activities would have mitigated impacts to a less than significant level through re-design, data recovery, or other similar methods. Any effects from the anticipated future actions following leasing would be mitigated to a less than significant level through implementation of best management practices during the permitting process.

11.3.12 TRIBAL INTERESTS AND TRADITIONAL CULTURAL RESOURCES

Setting

Tribal interests include economic rights such as Indian trust assets, and resource uses and access guaranteed by treaty rights. Traditional cultural resources or properties include areas of cultural importance to contemporary communities, such as sacred sites or resource gathering areas. While most commonly considered in the context of Native Americans and Native Alaskans, there are

traditional cultural resources associated with other ethnic or socially linked groups.

All three pending lease sites in Alaska are within the Northwest Coast culture region, as described broadly in the Appendix I of the PEIS. De Laguna (1990) provides an ethnographic overview of the project area within the larger Northwest Coast culture region. The following discussion is based primarily on that overview. The Alaska leases are considered to be within the traditional territory of Southern Tlingit-speaking groups. That area is further broken down into dialects of Tlingit, the lease area being on or near the boundary of the Sanya and Stikine dialects.

Traditional legends indicate that most Tlingit believe their ancestors first entered the area from the Tsimshian peninsula, while later groups from the interior migrated to this coastal region down rivers. In the project area tall mortuary totem poles were erected beside or in front of traditional houses. Shamanistic regalia were stored in boxes in the woods surrounding villages. Tlingit religion considers all living things, natural features, and celestial bodies to have a spirit or soul. Even some manufactured items were at times thought to embody such characteristics. After death, Tlingits were thought to enter a separate plane of existence and then be reincarnated (De Laguna 1990).

Consultation with federally-recognized tribes that are affiliated with the lease area was initiated on September 12, 2007 to identify and assess tribal concerns and traditional resources that may be affected by the undertaking. No responses from the tribes have been received as of the date of publication; however, the consultation process is considered on-going. While many traditional cultural resources are well known, some locations or resources may be privileged information that is restricted to specific practitioners or clans. For tribes, maintaining confidentiality and customs regarding traditional knowledge may take precedence over identifying and evaluating these resources, unless they are in imminent danger of damage or destruction.

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on tribal interests and traditional cultural resources.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on tribal interests and traditional cultural resources; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Impacts on Tribal Interests and Traditional Cultural Resources are assessed using the criteria found in Chapter 4 of Volume I the PEIS. Although no tribal interests or concerns have been identified by the consultation process, the process is considered on-going and such resources may be identified in the

future by tribes. Impacts on Tribal Interests would be minimized or avoided by implementing best management practices in Appendix D of Volume III of the PEIS for each of the phases of the Reasonably Foreseeable Development scenario as described in Chapter 2 of Volume I of the PEIS.

For traditional cultural resources, completion of the Section 106 process of the National Historic Preservation Act requires the BLM and FS to consult with the State Historic Preservation Office, tribes and other parties to identify and assess historic properties affected by the undertaking and develop measures to avoid, minimize, or mitigate any adverse effects of the undertaking on historic properties which includes traditional cultural properties. No Traditional Cultural Resources have been identified by consulted tribes thus far, but consultation is considered on-going. Additionally, archaeological resources such as those discussed in Section 11.3.11, *Cultural Resources*, are often considered traditional resources by tribes.

Impacts on traditional cultural resources could occur from anticipated future actions following leasing, such as exploration, drilling, utilization, and reclamation and abandonment through ground-disturbing activities, unauthorized actions, and alterations to setting and cultural landscapes. The nature of these impacts and mitigations are described in Chapter 4 of Volume I of the PEIS. Areas of potential effect would include access roads, well pads, power plant footprints, pipeline and transmission line routes, and construction staging areas as well as the aspects of setting that contribute to significance. These areas of potential effect would be developed at the project-specific level, and would require inventories, evaluations, and appropriate treatments as outlined in the best management practices of Appendix D in Volume III of the PEIS. Under these cultural resources best management practices, the BLM would also conduct Section 106 consultations with the State Historic Preservation Office, Native American tribes with ties to the project area, and local historic preservation groups to identify the presence and significance of cultural resources within or adjacent to the lease area and assess the level of impact of geothermal leasing and development on those resources. Project specific impacts after leasing would be reduced by implementing these best management practices.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on tribal interests and traditional resources; however, anticipated future actions associated with development of geothermal resources could cause such impacts. Past ground-disturbing activities and the project identified in Section 11.1.6, *Cumulative Projects*, may have had and may have effects on tribal interests and traditional resources given the regional density of cultural resources and general lack of terrestrial survey coverage. Presumably past activities would have mitigated impacts to less than significant levels through re-design, data recovery, oral histories, or other similar methods. Any effects from anticipated future actions

following leasing would be mitigated to less than significant levels through implementation of best management practices during the permitting process.

11.3.13 VISUAL RESOURCES

Setting

This section describes the visual resources in the region of influence, which is defined as the areas within and immediately surrounding the proposed lease areas. Described below is the method for managing scenic resources and the visual landscape of the lease areas.

The Forest Service's Scenery Management System is a tool for inventorying and managing scenic resources and classifies lands into the following seven Scenic Integrity Objectives:

- Very High
- High
- Moderate
- Low
- Very Low
- Unacceptably Low
- Unknown

According to the Tongass Land and Resource Management Plan Final Environmental Impact Statement Plan Amendment, the Tongass National Forest offers a variety of scenery to its visitors, from spectacular mountain ranges and the glaciers of the mainland to low-lying marine landscapes composed of intricate waterways, bays, and island groups (US Forest Service 2008b). The Forest is viewed from a variety of vantage points, including the communities of Southeast Alaska, the Alaska Marine Highway ferry route, cruise ship routes, existing road systems, popular small boat routes and anchorages, developed recreation sites and facilities, and hiking trails. Tourist-related flight seeing via small aircraft is increasing in popularity and provides aerial views of the forest landscape.

Bell Island is north of Revillagigedo Island, northeast of Spacious Bay, and southwest of Boroughs Bay. Most of the proposed lease areas are on most of Bell Island, and a portion is on the adjacent mainland. There are no bridges to this semi-remote island. There are no developed uses modifying the characteristic landscape of the proposed lease areas.

Bell Island is approximately 8 miles long, approximately 3 miles wide, and situated in a northeast to southwest position. The highest point on Bell Island is at approximately 2,500 feet and is at the northeast end of the island. Bell Island

Lakes, as well as hot springs, are at the southwestern end of the island. Creeks are also visible in various areas of Bell Island.

The landscape of Bell Island is similar to the surrounding islands and mainland. The terrain has a strong undulating appearance. Vegetation uniformly covers the terrain and is of varying heights and maturity. Bays and inlets pierce in to low-lying coastal areas, and lakes fill in interior depressions.

Boats or seaplanes may be seen on the water around Bell Island. Appendix F of the Forest Plan lists routes and use areas from which scenery will be emphasized (US Forest Service 2008b). Bell Island is a visual priority route for small boats and mid-size tour boats, and Bell Island Trail #927030 is a visual priority use area. There are no sources of light in the lease areas.

Impacts

The Tongass National Forest was unable to provide Scenic Integrity Objective classification for Bell Island. For the purpose of this analysis, it is assumed the lease areas on FS land are designated with a Moderate Scenic Integrity Objective.

Alternative A (No Action)

The No Action alternative would have no impact on visual resources.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on visual resources; however, anticipated geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. The potential risk of changes affecting visual resources is assessed for five significance criteria, which are described in the PEIS. Future actions based on the Reasonably Foreseeable Development scenario could result in changes that impact visual resources.

Future geothermal development activities could involve new structures, roads, and operations that are described in the Reasonably Foreseeable Development scenario. The new structures, roads, and operations would alter the characteristic landscape and be sources of light and glare. Depending on their exact location, they could also diminish scenic views afforded individuals participating in recreation activities. These impacts would be noticeable, because they would be in areas that are relatively undeveloped and would be near areas where various recreation activities occur year-round. It is assumed the stipulations outlined in Chapter 2 of the PEIS would result in positioning new structures, roads, and operations in the landscape so the landscape appeared only slightly altered and resulted in noticeable changes remaining visually subordinate to the landscape character. It is also assumed no bridges or other structures would be constructed to connect Bell Island to the mainland. As a result, changes to visual resources based on the Reasonably Foreseeable Development scenario would result in impacts on visual resources that would be consistent with a Moderate Scenic Integrity Objective.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on visual resources; however, anticipated future actions associated with development of geothermal resources could cause such impacts. Geothermal exploration and development could result in timber harvest, site clearing, and construction of power plants, pipelines, and transmission lines. This would contribute to the degradation of scenic resources in the area already occurring as a result of the intertie project.

11.3.14 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Setting

The lease area covers approximately 7,680 acres on and adjacent to Bell Island, Alaska. Prince of Wales-Outer Ketchikan Census Area was selected as the ROI for socioeconomic analysis as the impacts of leasing are likely to occur within this region. A summary of the population, housing, employment, local school data and low-income and minority populations for Prince of Wales-Outer Ketchikan Census Area is provided based on data from Census 1990 and 2000 population, demographic and housing information (US Census Bureau 1990, 2000).

Population

In 2006, population in Prince of Wales-Outer Ketchikan Census Area was estimated at 5,688 for the 7,410.62-square-mile census area (US Census Bureau 2008). This is a 7.6 percent population reduction from 1990, when the total population within the census area was 6,146. Between 1990 and 2000 population decreased by approximately 2 percent. Population density in this census area is very low, at approximately 0.8 people per square mile in 2000. The entire census area is rural. Current trends of population reduction are expected to continue for this census area (US Census Bureau 1990, 2000).

Housing

In 2000, there were 3,055 total housing units, 2,262 of which were occupied and 1,579 of which were owner occupied. Homeowner occupancy rate was 3.7 percent and rental occupancy rate was 11.3 percent. In 1990, there were 2,543 total housing units, of which 2,061 units were occupied and 1,247 were owner occupied. Homeowner occupancy rate was 3.3 percent and the rental occupancy rate was 9.5 percent. Occupancy rates for the census area are higher than the state average; in 2000, the homeowner occupancy rate for the state of Alaska was 1.9 percent and the rental occupancy rate was 7.8 percent (US Census Bureau 1990, 2000).

Employment

In 2000 the workforce consisted of 3,075 individuals, of which 461 people or 15 percent were unemployed. This unemployment rate has remained fairly stable; in 1990, when the workforce consisted of 3,077 people, 457 or 15 percent

were unemployed. This rate is higher than the state-wide rate of 9.4 percent unemployment. Due to a high degree of seasonal employment in the census area, census unemployment rates may not accurately reflect the unemployment rate in the area; labor statistics by month show an unemployment rate as high as 21 percent in the winter months (Alaska Department of Labor 2008).

Median household income in 2000 was $40,636, an increase over the 1990 median income of $39,495. The census area remains lower than the state wide median income of $51,571. Based on 2000 data, the industries employing the greatest percent of the population include educational, health and social services (20.9 percent); agriculture, forestry, fishing and hunting and mining (19.4 percent); retail trade (11.8 percent) and construction (10 percent) (US Census Bureau 1990, 2000).

Schools and Public Infrastructure

In 1990, 1,317 students were enrolled in K-12 education in the census area. In 2000 this number increased slightly to 1,473 students (US Census Bureau 1990, 2000). Student population is expected to follow local population trends.

Environmental Justice

The only minority present in significant amounts in the census area is American Indians or Alaskan Natives, which comprised approximately 38.7 percent of the population in the most recent data. Whites of non-Hispanic origin comprised 53.1 percent of the population and people of Hispanic or Latino origin comprised 1.7 percent of the population (US Census Bureau 1990, 2000). Details are provided in Table 11.3-3, below.

Table 11.3-3
Population Percentage by Race/Ethnicity in Prince of Wales-Outer Ketchikan Census Area

	1990	2000	Percent Change
Total Population	6,278	6,146	-2.1
White	3,859	3,265	- 15.3
Black/African American	9	9	0
American Indian/Alaskan Native	2,358	2,377	+ .8
Asian	28	22	-21
Pacific Islander*	N/A	3	N/A
Other	24	31	+ 29
Two or more*	N/A	439	N/A
Hispanic or Latino**	121	107	-11.6

Source: US Census Bureau 1990, 2000.
* Not reported on1990 census: Asian and Pacific Islanders were one group and more than one race was not an option.
** In combination with other race. Totals may add to more than 100 percent as individuals can report more than one race.

In 1999, 736 people (or 12.1 percent of the population) were living below the poverty level. This number is an increase over 1990 data in which approximately 570 individuals or 9 percent of the population surveyed was living below poverty level (US Census Bureau 1990, 2000).

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on existing socioeconomics in Prince of Wales-Outer Ketchikan Census Area. No impacts would occur to minority or low income populations.

Alternative B (Proposed Action)

The Proposed Action would not have any direct impact on socioeconomics or environmental justice; however, geothermal exploration and development activities likely to follow leasing would potentially result in such impacts. Impacts include a potential increase in jobs and decrease in unemployment in Prince of Wales-Outer Ketchikan Census Area due to construction and operations and maintenance jobs at a newly developed geothermal plant. Some population influx may occur to provide construction employment. The degree to which population influx will impact local schools or public infrastructure depends on the level of geothermal development.

Geothermal development would also be a positive stimulus to the local economy through increased tax revenues at the borough and state levels.

The Reasonably Foreseeable Development scenario predicts one plant of 20 MW is likely to be developed in the lease area. Impacts for a typical 50 MW plant development are discussed in Section 4 of the PEIS, Socioeconomics and Environmental Justice. Due to the rate of unemployment of 15 percent in the local area it is likely that many jobs may be filled by local census area residents, limiting the need for outside workers. As the population is currently dispersed, some temporary housing may be required near the lease site in the construction phase.

Impacts on the Native American/Native Alaskan individuals are possible as this group has a significant presence in the census area. However, negative impacts should be minimal as there are no residential areas in or adjacent to the lease areas.

Cumulative Impacts

The Proposed Action would not have any cumulative impacts on socioeconomics and environmental justice; however, anticipated future actions associated with development of geothermal resources could contribute to increases in employment opportunities in the region that are already expected as a result of the intertie project.

11.3.15 NOISE

Setting

Current sources of noise in the lease areas are limited to wind and wildlife. Sources of noise originating outside of the lease areas but affecting the lease areas are limited air traffic. Sensitive noise receptors are generally considered to be homes, hospitals, schools, and libraries. The only buildings or developments within half a mile of the lease area are the seaplane ramp and the Bell Island Hot Springs facility.

Impacts

Alternative A (No Action)

The No Action alternative would have no impact on noise.

Alternative B (Proposed Action)

Neither the Proposed Action nor anticipated future actions following leasing would have any impact on noise since no sensitive receptors have been identified within or adjacent to the lease areas.

Cumulative Impacts

Neither the Proposed Action nor anticipated future actions associated with development of geothermal resources following leasing would have cumulative impacts on noise in the lease area since the intertie project is not expected to generate noise once it is operational.

This Page Intentionally Left Blank

SECTION 11.4
REFERENCES

Alaska Department of Labor and Workforce Development, 2008. Labor Force Statistics by Month for Prince of Wales-Outer Ketchikan 1990 to Present. Internet Web site: http://www.labor.state.ak.us/research/emp_ue/powlf.htm. Updated February 2008. Accessed on April 2008.

Alaska Department of Natural Resources. 2008. Water Resources Program. 2008. Alaska Department of Natural Resources, Division of Mining, Land and Water. Internet Web site: http://www.dnr.state.ak.us/mlw/water/index.htm. Accessed on April 18, 2008.

Bureau of Land Management. 2008. Ring of Fire Record of Decision and Approved Resource Management Plan. US Department of the Interior, Bureau of Land Management, Anchorage Field Office, Anchorage, Alaska.

De Laguna, Frederica. 1990. "Tlingit." In *Handbook of North American Indians*, Volume 7 – Northwest Coast. Wayne Suttles, Volume Editor. William C. Sturtevant, General Editor. Smithsonian Institution, Washington, D.C.

Historical Research Associates, Inc. Undated. Final Report – Swan Lake-Lake Tyee Intertie EIS Cultural Resource Survey, Specialist Report, Volume II. On file at the Ketchikan Misty Fiords Ranger District, Tongass National Forest, Ketchikan, AK.

Huette. 2008. Bob Huette, Botanist, US Forest Service, Ketchikan-Misty Fiords Ranger District. Personal communication with Ty Brookhart of EMPSi. April 18, 2008.

Ketchikan Public Utilities. 2004. http://www.city.ketchikan.ak.us/public_utilities/index.html. Updated 2004. Accessed April 2008. Copyright 2004.

Kolund, Lynn. 2008. Ketchikan-Misty Fiords District Ranger, Tongass National Forest. Personal communication with Andrew Gentile of EMPSi. April 4, 2008.

MacDonald, S.O. and J.A. Cook. 2007. Mammals and Amphibians of Southeast Alaska. Museum of SW Biology – UNM Special Pub. #8,

Motyka, RJ, Moorman, MA, and JW Reeder. 1980. Alaska Open-File Report 127-Assessement of Thermal Springs Sites in Southern Southeastern Alaska-Preliminary Results and Evaluation-Abstract. Available at: http://www.osti.gov/bridge/product.biblio.jsp?osti_id=897428. Accessed on April 18th, 2008.

Neusius, Sarah W. and G. Timothy Gross. 2007. *Seeking Our Past: An Introduction to North American Archaeology*. Oxford University Press, NY.

Silkworth. 2008. Darin Silkworth, Soil Scientist, US Forest Service, Ketchikan-Misty Fiords Ranger District. Personal communication with Jill-Marie Seymour of EMPSi. April 14, 2008.

Stanford. 2006. Martin Stanford, Archaeologist, Tongass NF. An Archaeological Clearance Report for a Geothermal Exploration Drilling Program on Bell Island, Southern Southeast Alaska, Tongass National Forest. CRM Report #R2006100552003. On file at the Ketchikan Misty Fiords Ranger District, Tongass National Forest, Ketchikan, AK. October 16, 2006.

US Census Bureau 1990. Census 1900 Summary Files 1, 3. Geographic Area: Prince of Wales-Outer Ketchikan Census Area, Alaska. http://quickfacts.census.gov/qfd/states/02/02201lk.html

US Census Bureau 2000. Census 2000 Summary Files 1, 3. Geographic Area: Prince of Wales-Outer Ketchikan Census Area, Alaska. http://quickfacts.census.gov/qfd/states/02/02201lk.html

US Census Bureau. 2008. State and County QuickFacts. http://quickfacts.census.gov/qfd/states states/02/02201.html Accessed on April, 2008. Last revised January 2, 2008.

US Environmental Protection Agency. 2008. Southeast Mainland Watershed—19010101. US Environmental Protection Agency. Internet Web site: http://cfpub.epa.gov/surf/huc.cfm?huc_code=19010101. Accessed on April 18, 2008.

US Forest Service. 2008a. Tongass National Forest. Internet Web site: http://www.fs.fed.us/r10/tongass/forest_facts/faqs/intertie.shtml. Accessed on April 7, 2008.

US Forest Service. 2008b. Tongass National Forest, Land and Resource Management Plan. United States Department of Agriculture, January 2008. Forest Service R10-MB-603b.

US Forest Service. 2008c. Birds in the Tongass. US Forest Service, Region 6. Internet Web site: www.fs.fed.us/r10/tongass/forest_facts/resources/fauna_flora/birdfacts.shtml Accessed on April 21, 2008.

US Geological Survey. 1994. Ground Water Atlas of the United States, Alaska, Hawaii, Puerto Rico and the US Virgin Islands. US Geological Survey. Internet Web site: http://capp.water.usgs.gov/gwa/ch_n/N-AKtext1.html. Accessed on April 11, 2008.

US Geological Survey. 2002. Ground Water Atlas Archive of the United States. 2002. US Geological Survey. Internet Web site: http://capp.water.usgs.gov/gwa/gwa/gwa.html. Accessed on January 4, 2008.

US Geological Survey. 2003. Earthquakes in Alaska. 2003. US Geological Survey. Internet Web site: http://jclahr.com/alaska/aeic/eq_in_ak/eq_in_ak.jpg. Accessed on April 17, 2008.

US Geological Survey. 2004. Geological Provinces of the United States. US Geological Survey. Internet Web site: http://geology.wr.usgs.gov/parks/province/basinrange.html. Accessed on April 16, 2008.

Western Regional Climate Center. 2007. Monthly Climate Summary for Ketchikan, Alaska from 9/1/1949 to 6/30/2007. Available at http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak4590. Accessed on April 17, 2008.

This Page Intentionally Left Blank