United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle, WA 98101

Alaska
Idaho
Oregon
Washington

# Environmental Assessment
## for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and Gas Development Project

**Cook Inlet, Alaska**

**National Pollutant Discharge Elimination System (NPDES) Permit No. AK-053309**

**January 2002**

Prepared by:

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Prepared for:

U.S. Environmental Protection Agency Region 10
Office of Water, NPDES Permits Unit

Contract No. 68-W7-0050, Delivery Order 2004

SAIC Project No. 01-0817-01-9695-00

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# 1.0 INTRODUCTION

This environmental assessment (EA) addresses potential environmental consequences associated with the development of the Redoubt Shoal Unit in central Cook Inlet. The Redoubt Shoal Unit Development Project includes the production of oil and gas reserves from the Osprey Platform located in Cook Inlet. Forest Oil Corporation (formerly Forcenergy, Inc.) is the owner and operator of the Osprey Platform and is currently conducting exploration drilling operations. Undeveloped oil and gas reservoirs, known collectively as the Redoubt Shoal Unit, are located within drilling reach of the Osprey Platform. Should commercial quantities of oil and gas be confirmed at the Redoubt Shoal Unit, the Osprey Platform would be converted to an oil and gas production platform.

The scope of the proposed development includes the following components:

- Conversion of the Osprey Platform from a manned exploratory platform to a minimally-manned production platform.
- Production drilling operations using freshwater-based and oil-based drilling fluids. Drilling muds and cuttings will be disposed of with on-platform grind and injection facilities.
- Construction of a new oil production facility located near Kustatan on the West Foreland for oil separation, platform power generation, and produced water treatment for reinjection off shore.
- Transportation of crude oil and natural gas from the Redoubt Shoal Unit to the new oil production facility.
- Transportation of crude oil from the new oil production facility to existing facilities onshore (through the Trading Bay Production Facility).

The proposed project anticipates production of up to 25,000 barrels of crude oil per day and 4.3 million cubic feet per day of natural gas (NCG 2001). The crude oil will be sent via pipeline to the Trading Bay Production Facility (which is jointly owned by Unocal and Forest Oil) where it will be tied into the existing Cook Inlet Pipe Line Company system, and then transported to the Drift River Facility. From there, the oil will be sent by tanker either to local, domestic, or foreign markets. Natural gas may either be used as fuel to support local Forest Oil operations or be sent via pipelines to other local markets.

## 1.1 PURPOSE OF ACTION

Forest Oil has applied for an individual new source National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit from the United States Environmental Protection Agency (EPA), Region 10. The NPDES permit action will cover proposed discharges from the Osprey Platform to territorial waters of the United States, off the tip of the West Foreland in Cook Inlet. Proposed discharges include deck drainage, sanitary waste, domestic waste, and boiler blowdown.

## 1.2 NEED FOR ACTION

Issuance of an NPDES permit by EPA is needed to allow Forest Oil to develop oil and gas reserves at a reasonable profit to meet world market demands for oil and gas. The proposed project will increase currently declining Cook Inlet crude oil production (currently just below 30,000 barrels per day) by approximately 90 percent. By comparison, the total Cook Inlet crude oil production at its peak (in 1970) was about 225,000 barrels per day. The total natural gas production from the proposed project represents less than 1 percent of the currently increasing natural gas production in the Cook Inlet area (about 222 billion cubic feet per year in 1996) (NCG 2001).

## 1.3 PROJECT LOCATION

The Osprey Platform was placed onsite during late June 2000, approximately 1.8 miles southeast of the end of the West Foreland (latitude 60º 41’ 46” N, longitude 151º 40’ 10” W), as shown in Figure 1-1. The water depth at the site is approximately 45 feet (referenced to mean lower low water).

The onshore production facility will be located near the historic village of Kustatan on land owned by Forest Oil. The land was sold to Forest Oil (formerly Forcenergy) by the Salamatof Native Corporation (NCG 2001). Forest Oil plans to construct the facility (referred to in this document as the Kustatan Production Facility) at the site of its former Tomcat Exploration Drilling Project (Amundsen 2001).

## 1.4 PROJECT HISTORY

On April 14, 1999, Forcenergy, Inc. submitted an Environmental Information Document (EID) to EPA, and sought early comments on the EID prior to submittal of an NPDES permit application. On May 28, 1999, based on a determination that the scope of the EID was insufficient, EPA sent a comment letter to Forcenergy indicating that the EID needed to be revised with additional information.

On October 4, 1999, EPA received a revised EID. On October 15, 1999, Forcenergy submitted an NPDES application. The permit application identified the following discharges: drilling mud and drill cuttings; deck drainage; sanitary wastes; domestic wastes; boiler blowdown; fire control system test water; non-contact cooling water; excess cement slurry, and completion fluids. EPA initially explained to Forcenergy that the planned discharge of drilling muds and cuttings could potentially adversely affect water quality and would necessitate undertaking an Environmental Impact Statement (EIS).

However, by late December 1999, EPA sent a letter to Forcenergy indicating they would consider undertaking an EA upon receipt of additional information and after a public scoping notice to ascertain if there were significant public concerns with the project. On January 3, 2000, EPA sent the scoping notice packet to interested parties, and the comment period ended on February 14, 2000.

The scoping comment letters revealed that there were public concerns with potential impacts to set net fishery operations, water quality issues, and cultural resources. These public concerns and EPA’s December 1999 comments on the revised EID were discussed with Forcenergy. Based on the sufficiency of Forcenergy’s response to the EPA and public concerns, EPA decided to proceed with an EA.

Forcenergy, Inc. submitted a revised NPDES permit application on February 29, 2000. This application (provided as Appendix A) no longer identified discharge of drilling muds and cuttings or completion fluids. These waste streams are proposed to be reinjected into a Class II injection well that must be permitted and approved by the Alaska Oil and Gas Conservation Commission (AOGCC).

In December 2000, Forest Oil Corporation (Forest Oil) acquired Forcenergy, Inc.

On February 20, 2001, Forest Oil announced that a test well at the Redoubt Shoal Unit produced 1,010 barrels of oil per day (ADN 2001). Forest Oil officials estimated that a single well could produce up to 2,500 barrels of oil per day from this formation. Installation of three additional exploration wells was planned within the following six months (March through August 2001). If the field meets Forest Oil’s expectations, the Redoubt Shoal Unit could hold as much as 50 million barrels of oil and produce 25,000 barrels per day (ADN 2001).

## 1.5 EA Development Process

The scoping notice that was sent to the public to request information was helpful in evaluating potential impacts of the Redoubt Shoal Unit Development Project. Issues raised by commenters were used in defining the scope of this EA. The EA may result in a Finding of No Significant Impact (FONSI), or may determine that a FONSI can not be issued and an EIS should be undertaken. If a FONSI is to be issued, the EA/FONSI will be submitted to the public for a 30-day comment period. All comments received from the public, tribal governments, or other agencies on issues relating to the project will be summarized and responses prepared. These will be sent to the public as an addendum to the "response to comments" section of the final NPDES permit.

## 1.6 EPA Role, Responsibility, and Limitation of Authority/Jurisdiction

The environmental review of major Federal actions significantly affecting the quality of the environment is required by the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) established regulations for implementing NEPA in 40 CFR Part 1500. EPA established regulations to govern its compliance with NEPA in 40 CFR Part 6. EPA's NEPA compliance responsibilities include the "cross-cutter" statutes, i.e., Endangered Species Act, National Historic Preservation Act, the Executive Order on Environmental Justice, and Executive Orders on wetlands, flood plains, farmland, and biodiversity. The NEPA compliance program requires analysis of information regarding potential impacts including environmental, cultural, and public health impacts; development and analysis of options to avoid or minimize impacts; and development and analysis of measures to mitigate adverse impacts. Areas of consideration under NEPA may include natural resources, and cultural, social, and economic issues.

EPA effluent limitation guidelines and new source performance standards for oil and gas extraction point source category projects went into effect on December 16, 1996 (61 FR 66123). With promulgation of the new source performance standards for oil and gas extraction, those oil and gas extraction projects requiring NPDES permits, which are defined as "new sources," are subject to the provisions of NEPA. Pursuant to EPA's implementing regulations (40 CFR 6.108), new source NPDES applicants are required to submit an EID in conjunction with their NPDES permit application.

As EPA has regulatory authority only for the NPDES discharge, this EA focuses primarily on the water quality impacts associated with the NPDES discharge. However, in recognition of EPA's responsibilities under NEPA to fully disclose all potential environmental impacts related to the proposed project, potential impacts other than those associated with the NPDES discharge are described in this EA. In addition, the EA identifies the specific federal and state agencies under whose permit authorization mitigation measures for environmental impacts may be applicable.

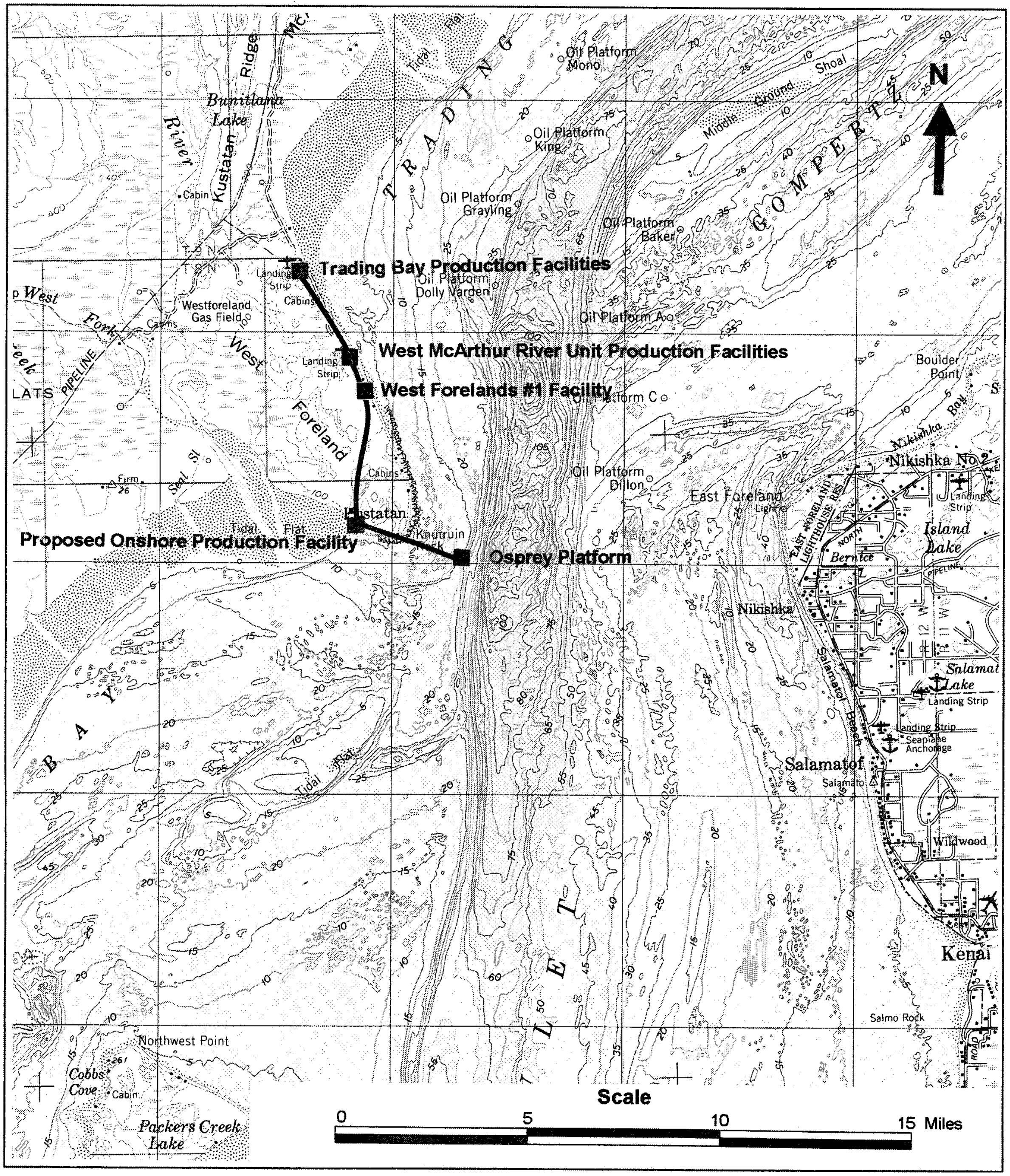



**Figure 1-1. General Location Map**

# 2.0 PROJECT ALTERNATIVES

## 2.1 INTRODUCTION

The proposed development of the Redoubt Shoal Unit includes the following components:

- Drilling and operation of wells for production of oil, natural gas, and natural gas liquids
- Installation of oil, natural gas, and natural gas liquids processing equipment onboard the Osprey Platform
- Construction and operation of an onshore production facility located near Kustatan on the West Foreland
- Construction and operation of pipelines to transport oil, natural gas, and/or natural gas liquids (NGLs) from the Osprey Platform ultimately to existing pipeline systems located onshore at Trading Bay on the west side of Cook Inlet.

### 2.1.1 Options Development and Screening Process

Various location/engineering/environmental options were initially considered and eliminated during the options development and screening process (NCG 2001). Options eliminated as part of the initial planning stage include:

- <u>Location of the production platform in deeper water directly over the Redoubt Shoal Unit:</u> This option would have required construction of a platform in considerably deeper water where currents are particularly strong. Potential conflicts would occur with both the fishing industry and with marine traffic operating in the area. Maximum reaches from the proposed platform location to the potential reservoirs will be 20,000 feet, which is well within capabilities of existing technology; as such, the deep water option was not considered further.
- <u>Offshore discharge of drilling muds and cuttings:</u> This option could have resulted in potentially significant impacts on the marine environment and would have necessitated the preparation of an EIS. These materials will be disposed of by grinding and injection into subsurface formations
- <u>Location of the Kustatan Production Facility at the former Kustatan Village site:</u> This site could have resulted in potentially significant impacts on the cultural resources associated with that site. The facility and roads to the tip of the West Forelands now avoid areas of potential impacts on cultural resources associated with the former Kustatan Village.

These options are no longer being considered and are not evaluated further in this EA.

Options related to the transport of oil, gas, and natural gas liquids from the Osprey Platform to a new production facility near Kustatan or to the Trading Bay Production Facility are evaluated in this EA. In addition, the options related to the mode of construction of the transition through the bluffs at the West Foreland or Trading Bay areas are considered. Specific options include boring through the bluff (included in Alternatives 1 and 2), and bluff cut/trenching (included in Alternatives 1, 2, and 3).

### 2.1.2 Alternatives Identification

The following sections describe the major components of the proposed project and alternatives, including the Osprey Platform; underwater pipelines and utilities; onshore pipelines; and the proposed Kustatan Production Facility. Pipelines connecting the Kustatan Production Facility to existing onshore infrastructure are not evaluated as part of this EA because the pipelines/access roads from this location to the West McArthur River Unit and Trading Bay Production Facility were considered during the environmental review of the Tomcat Exploratory Drilling Project. Proposed pipeline routes are shown in Figure 2-1. The following alternatives are described in detail in Section 2.2:

- Proposed project (Alternative 1): Includes conversion of the Osprey Platform to production operations, construction of the Kustatan Production Facility, and construction of 1.8-mile underwater and 1.8-mile onshore pipelines/utilities from the Osprey Platform to the proposed production facility.
- Alternative 2: Includes conversion of the Osprey Platform to production operations, construction of the Kustatan Production Facility, and construction of 3.3-mile underwater pipelines/utilities from the Osprey Platform to the proposed production facility.
- Alternative 3: Includes conversion of the Osprey Platform to production operations, and construction of 10.5-mile underwater pipelines/utilities from the Osprey Platform to the Trading Bay Production Facility.
- Alternative 4: No action.

## 2.2 Proposed Project (Alternative 1)

### 2.2.1 Osprey Platform

The Osprey Platform, by design, is a movable drilling platform that has been constructed to support exploration drilling operations for the Redoubt Shoal Unit (Figure 2-2). The platform was placed onsite during late June 2000, approximately 1.8 miles southeast of the end of the West Foreland (latitude $60^{O}$ 41’ 46” N, longitude $151^{o}$ 40’ 10” W). The water depth at the site is approximately 45 feet (referenced to mean lower low water). The platform is designed to handle anticipated oceanographic, meteorological, and seismic design conditions for the area (see Table 2-1) (NCG 2001).

At the completion of the exploration drilling operations (which have been conducted under the general NPDES permit for Oil and Gas Exploration [AKG285024]), the Osprey Platform will be used to support offshore production operations as described below, or be removed if oil and gas are not found in commercial quantities. Platform conversion would include the addition of limited production equipment and the installation of underwater pipelines and utility lines.

If the platform is not to be converted to production, wells will be plugged and abandoned, the piling and conductors will be cut and the platform floated off-location (similar to the manner in which it was floated on location). These operations would be conducted in accordance with regulations and appropriate approvals from the AOGCC, the Alaska Department of Natural Resources (ADNR), and the Minerals Management Service (MMS).

Figure 2-3 provides a schematic of the process flow for production operations onboard the Osprey Platform. Production activities are summarized below.

#### 2.2.1.1 Completion

After confirmation of a successfully producing formation, the well will be prepared for hydrocarbon extraction, or "completion." The completion process includes setting and cementing of the production casing; packing the well; and installing the production tubing. During the completion process, equipment is installed in the well to allow hydrocarbons to be extracted from the reservoir. Completion methods are determined based on the type of producing formation, such as hard or loose sand, and consist of four steps: wellbore flush, production tubing installation, casing perforation, and wellhead installation.

#### 2.2.1.2 Fluid Extraction

The fluid that will be produced from the oil reservoir consists of crude oil, natural gas, and produced water. Production fluids will flow to the surface, through tubing inserted within the cased borehole, using electric submersible pumps. As hydrocarbons are produced, the natural pressure in the reservoir decreases and additional pressure must be added to the reservoir to continue production of the fluids. The additional pressure will be provided artificially to the reservoir using waterflooding, which is the injection of water into the reservoir to maintain formation pressure that would otherwise drop as the withdrawal of the formation fluids continues.

#### 2.2.1.3 Fluid Separation

As the produced fluids (natural gas, crude oil, and produced water) surface from the wells, the gas will be separated from the liquids in a two-phase separator on the platform. The wet gases from the separator will pass through a glycol dehydrator to remove water and then will be used to support platform heating or will be shipped by pipeline to the Kustatan Production Facility. A low-pressure relief and vent system will be provided on the Osprey Platform. The low-pressure vent system will be connected to a flare scrubber and routed to a low-pressure flare. This flare is intended for use as vessel/piping safety depressurization in the event of platform emergencies.

Liquids will be pumped to the Wet Oil Surge Vessel and then pumped to the Kustatan Production Facility for oil-water separation. There will be no storage capacity onboard the Osprey Platform for separated liquids. The produced water separated from the crude oil at the Kustatan Production Facility will then be pumped back to the Osprey Platform by pipeline for downhole injection to maintain formation pressures within the Redoubt Shoal Unit.

#### 2.2.1.4 Well Treatment

Well treatment is the process of stimulating a producing well to improve oil or gas productivity. It is not anticipated that stimulation will be needed for the wells. However, if well treatment is required at the Osprey Platform, the method used will be acid treatment. Acid stimulation is performed by injecting acid solutions into the formation. The acid solution dissolves portions of the formation rock, thus enlarging the openings in the formation. The acid solution must be water soluble, safe to handle, inhibited to minimize damage to the well casing and piping, and inexpensive.

#### 2.2.1.5 Workover

Workovers or treatment jobs occur approximately once per year. Workover operations are performed on a well to improve or restore productivity, repair or replace downhole equipment, evaluate the formation, or abandon the well. Workover operations include well pulling, stimulation (acidizing and fracturing), washout, reperforating, reconditioning, gravel packing, casing repair, and replacement of subsurface equipment. The four general classifications of workover operations are pump, wireline, concentric, and conventional. Workovers can be performed using the original derrick. The operations begin by using a workover fluid to force the production fluids back into the formation, to prevent them from exiting the well during the operation.

#### 2.2.1.6 Well Drilling

Rotary drilling is the process that is used to drill the well. The rotary drill consists of a drill bit attached to the end of a drill pipe. The most significant waste streams, in terms of volume and constituents associated with the drilling activities, are drilling fluids and drill cuttings. Drill cuttings are particles (e.g., sand, gravel, etc.) generated by drilling into subsurface geological formations and carried to the surface with the drilling fluid. The drilling fluid, or mud, is a mixture of water, special clays, and certain minerals and chemicals used to cool and lubricate the bit, stabilize the walls of the borehole, and maintain equilibrium between the borehole and the formation pressure. The drilling fluid is pumped downhole through the drill string and is ejected through the nozzles in the drill bit and then circulated to the surface through the annulus. The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

#### 2.2.1.7 Fuel Tanks

Primary fuel tanks will include a 20,000-gallon main tank (Tank 1) located in the platform Lower Deck, and two 4,000-gallon tanks (Tanks 2 and 3) integral to each of the two pedestal cranes. Tank 1 is filled directly by supply vessels through either of two marine transfer stations located on the platform. The two pedestal tanks may either be filled directly by marine transfers or from Tank 1. These primary tanks are constructed to Det Norske Veritas Standards (NCG 2001) and are equipped with level gauges and high level alarms. The platform serves as secondary containment for the entire volume of Tank 1; Tanks 2 and 3 do not have secondary containment for their entire volumes.

#### 2.2.1.8 Permitted Discharges from the Osprey Platform

*Deck Drainage.* Deck drainage refers to any waste resulting from platform washing, deck washing, spillage, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. This could also include pollutants, such as detergents used in platform and equipment washing, oil, grease, and drilling fluids spilled during normal operations (Avanti 1992). On the Osprey Platform, contaminated deck drainage will be treated through an oil-water separator prior to discharge (Amundsen 2000a). Non-contaminated deck drainage will be discharged with no treatment. The average flow of deck drainage from the platform will be 108,000 gallons per day (NCG 2001), depending on precipitation. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70.020).

*Sanitary Waste.* Sanitary waste is human body waste discharged from toilets and urinals. The sanitary waste system on the Osprey Platform, an aerated marine sanitation device, will serve a 3- to 55-person crew residing on the platform at any one time. The expected maximum quantity of sanitary waste discharged is 2,020 gallons per day (United Industries Group 1998 and NCG 2001). The pollutants associated with this discharge include suspended solids, 5-day biochemical oxygen demand ($BOD_5$), fecal coliform, and residual chlorine. All sanitary discharges will be in accordance with the appropriate water quality standards and effluent treatability requirements for the state of Alaska (18 AAC 70, 18 AAC 72, and 40 CFR 133.105).

*Domestic Waste.* Domestic waste (gray water) refers to materials discharged from sinks, showers, laundries, safety showers, eyewash stations, and galleys. Gray water can include kitchen solids, detergents, cleansers, oil and grease. Domestic waste will not be treated prior to discharge. The expected quantity of domestic waste discharged is 4,000 gallons per day (NCG 2001). All domestic discharges will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

*Boiler Blowdown.* Boiler blowdown is the discharge of water and minerals drained from boiler drums to minimize solids build-up in the boiler. Boiler blowdown discharges are "not planned or likely, but possible to occur intermittently" (Amundsen 2000a). The expected quantity of boiler blowdown is 100 gallons per event. Boiler blowdown will be treated through an oil-water separator prior to discharge (Amundsen 2000a). This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

*Fire Control System Test Water.* Fire control system test water is seawater that is released during the training of personnel in fire protection, and the testing and maintenance of fire protection equipment on the platform. This discharge is intermittent, and is expected to occur approximately 12 times per year. The expected quantity of fire control system test water is 750 gallons per minute (gpm) for 30 minutes, for a total discharge per event of 22,500 gallons. Contaminated fire control system test water will be treated through an oil-water separator prior to discharge. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

*Non-Contact Cooling Water.* Non-contact cooling water is seawater that is used for non-contact, once-through cooling of various pieces of machinery on the platform. The expected quantity of non-contact cooling water is 300,000 gallons per day (gpd). This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

*Excess Cement Slurry.* Excess cement slurry will result from equipment washdown after cementing operations. Excess cement slurry will be discharged intermittently while drilling, depending on drilling, casing, and testing program/problems (Amundsen 2000a). Approximately 30 discharge events are anticipated per year, with a maximum discharge of 100 barrels (or 4,200 gallons) per event. Excess cement slurry will not be treated prior to discharge. Discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

#### 2.2.1.9 Drilling Wastes

Water-based drilling muds and cuttings will be discharged to Cook Inlet during the exploration phase of operations (currently permitted) in accordance with the Cook Inlet General NPDES Permit; however, they will not be discharged as part of the production drilling operations. Drilling muds and cutting from the production phase are planned to be disposed of by grinding the muds and cuttings and injecting them into a Class II injection well located beneath the Osprey Platform. This process will be a continuous process and will not require storage of drilling effluents onboard the platform. The injection well will be constructed, tested, and operated in accordance with approved AOGCC procedures. Approximately 16 wells would be drilled during the production phase. Each well would take about 1 to 2 months to drill. Drilling wastes are described in more detail below.

*Drilling Fluids.* Drilling fluids are the circulating fluids (muds) used in the rotary drilling of wells to clean and condition the hole, to counterbalance formation pressure, and to transport drill cuttings to the surface. A water-based drilling fluid is the conventional drilling mud in which water is the continuous phase and the suspending medium for solids, whether or not oil is present. An oil-based drilling fluid has diesel, mineral, or some other oil as its continuous phase, with water as the dispersed phase. Production drilling operations onboard the Osprey Platform will use a combination of both freshwater-based and oil-based drilling fluids. The freshwater-based drilling fluids will typically be used for the upper 2,500 feet of the well and the oil-based drilling fluids will be used for depths below 2,500 feet (NCG 2001). The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

*Drill Cuttings.* Drill cuttings are the particles generated by drilling into subsurface geologic formations and carried to the surface with the drilling fluid. The separated drill cuttings will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Dewatering Effluent.* Dewatering effluent is wastewater from drilling fluid and drill cutting dewatering activities. The dewatering effluent will be disposed of with the separated drill cuttings into a Class II injection well that has been permitted with the AOGCC.

*Waterflooding Discharges.* Waterflooding discharges are discharges associated with the treatment of seawater prior to its injection into a hydrocarbon-bearing formation to improve the flow of hydrocarbons from production wells, and prior to its use in operating physical/chemical treatment units for sanitary waste. These discharges include strainer and filter backwash water. All waterflooding discharges will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Produced Water.* Produced water refers to the water (brine) brought up from the hydrocarbon-bearing strata during the extraction of oil and gas, and can include formation water, injection water, and any chemicals added downhole or during the oil/water separation process. The produced water will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Well Completion Fluids.* Well completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the well bore during operations which prepare the drilled well for hydrocarbon production. The well completion fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Workover Fluids.* Workover fluids are salt solutions, weighted brines, polymers, or other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures. The workover fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Well Treatment Fluids.* Well treatment fluid refers to any fluid used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled. The well treatment fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Test Fluids.* Test fluids are discharges that occur if hydrocarbons located during exploratory drilling are tested for formation pressure and content. This would consist of fluids sent downhole during testing, along with water from the formation. The test fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

*Produced Solids.* Produced solids are sands and other solids deposited from produced water which collect in vessels and lines and which must be removed to maintain adequate vessel and line capacities. The produced solids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.2 Underwater Pipelines and Utilities

A total of four pipelines/utility lines are planned between the Osprey Platform and the Kustatan Production Facility during the production operations (NCG 2001):

- One 6-inch pipeline to carry natural gas from the Osprey Platform to the Kustatan Production Facility. An estimated 5.8 million standard cubic feet per day of natural gas will be shipped at 150 psig and 130ºF.
- One 8-inch pipeline to carry wet oil to the Kustatan Production Facility. An estimated 25,000 barrels per day of oil and 6,000 barrels per day of water will be shipped at approximately 350 psig and 130ºF.
- One 8-inch pipeline to carry treated produced and fresh water from the Kustatan Production Facility back to the Osprey Platform for injection. The maximum rate of transport is estimated at 25,000 barrels per day at a pressure of 5,000 psig.
- One or two armored power cables to carry power for offshore production operations from the Kustatan Production Facility to the Osprey Platform. Plans are also being evaluated to place the cables inside a utility pipeline.

2.2.2.1 Design Criteria

Design criteria used for the proposed underwater pipelines are summarized on Table 2-2.

2.2.2.2 Construction Techniques

The pipelines will be made up onshore and pulled to the Osprey Platform using a winch system installed on a barge temporarily moored near the platform. This approach will avoid the use of lay barges, which are both expensive to mobilize and generally produce greater impacts than the pipeline pull method.

Nearshore, the pipelines will be buried to avoid problems with shore ice (a standard procedure in the Cook Inlet area). The proposed project assumes that the nearshore pipeline will be placed by trenching and cutting through the intertidal/shallow subtidal area and through the bluff. The pipe trench will be constructed from a 150-foot barge using either a backhoe or clamshell, with a production rate of approximately 10 cubic yards per minute (NCG 2001).

The technical feasibility of placing the pipeline through an augured hole through the intertidal area adjacent to the beach bluff is currently being evaluated. Engineering investigations and evaluations are currently underway (NCG 2001).

2.2.2.3 Spill Detection and Prevention

An estimated 25,000 barrels per day of oil and 6,000 barrels per day of produced water will be transported through an 8-inch pipeline between the platform and shore. Installation and operation of the pipeline will be in excess of Alaska Department of Environmental Conservation (ADEC) requirements for oil gathering lines. A Signal Conditioning and Data Acquisition (SCADA) system will be installed to monitor pressures and flow at both the platform and Kustatan Production Facility. A leak detection system will be installed to detect spills of at least one percent of the total daily throughput (an ADEC requirement for oil transmission pipelines). Procedures will be in place to immediately shut down the pipeline should a leak be detected. All pipelines will be configured so that it is possible to run smart pigs through the pipelines.

The pipelines would be operated under an Oil Discharge Prevention and Contingency Plan that is reviewed and approved by the ADEC. The U.S. Coast Guard (USCG) and MMS also have review and approval authority for this document under the Oil Pollution Act of 1990.

### 2.2.3 Kustatan Production Facility

The Kustatan Production Facility will be located on land owned by Forest Oil near the end of the West Foreland at the site of the Tomcat Exploratory Drilling Project. Although the detailed facility layout has not yet been finalized, the production facilities are expected to be contained within an upland area covering less than 10 acres (NCG 2001). A schematic of the overall process flow at the onshore facility is provided in Figure 2-4, and a preliminary layout for the facility is provided in Figure 2-5. The perimeter of the pad will be bermed to provide added secondary containment for spills on the site. Various components of the Kustatan Production Facility are described in the following sections.

#### 2.2.3.1 Gas Handling System

Natural gas from the Osprey Platform will pass through a compressor to bring the natural gas up to 500-psig pressure. Natural gas generated during onshore separation processes will be compressed and pass through a dehydration unit to produce dry gas at 500 psig. Approximately 3.7 million standard cubic feet per day of dry natural gas will be used to fuel turbines and other equipment at the Kustatan Production Facility. The remaining gas (an estimated 2.1 million standard cubic feet per day) will be sent via sales pipeline for use at the West McArthur River Unit or the Trading Bay Production Facilities.

#### 2.2.3.2 Oil Handling Systems

Wet oil from the Osprey Platform will pass through a wet oil exchanger surge vessel, flow splitter, and several dehydrator systems. The dry oil (having less than 2.5 percent water and solids) will be pumped to dry oil storage tanks, metered, and then sent via a sales pipeline to the Trading Bay Production Facilities. Reject oil ("dry" oil having excess water or solids) will be reprocessed through the system. Produced water removed from the oil stream will pass through a wash tank and water processing unit to skim any remaining oil from the water; skimmed oil will be sent to a slop oil tank and be reprocessed through the system.

#### 2.2.3.3 Water Handling Systems

Water handling systems are required primarily to prepare water for use in formation pressure maintenance operations for enhanced oil recovery in the Redoubt Shoal Unit. All produced water will be processed and will provide about 6,000 barrels per day of water during the first year of operation. An additional 19,000 barrels per day of fresh water will be obtained during the first year from water wells drilled at or in the vicinity of the Kustatan Production Facility. It is estimated that produced water will gradually increase with time and within about 15 years will be able to provide all water requirements for maintenance of formation pressures (NCG 2001); correspondingly, fresh water requirements will be reduced over this same time period. Cleaned water will be sent back to the Osprey Platform through an 8-inch pipeline at a rate of up to 30,000 barrels per day and at a pressure of 5,000 psig.

#### 2.2.3.4 Electrical Power Production

Peak power requirements are estimated to be 3,000 to 7,000 kilowatts (KW) for the Osprey Platform (the rate is dependent on whether drilling operations are being conducted) and 4,000 KW for the Kustatan Production Facility. A total of three 5,000-KW units are currently planned with natural gas for fuel (about 1.6 thousand standard cubic feet per day per unit). Two 500-KW diesel engine generator sets are provided for emergency power; these sources are not intended to maintain production operations. One or two 15-kilovolt (KV) armored subsea cables will be used to supply power to the platform.

### 2.2.4 Onshore Pipelines

Under the proposed project, the underwater pipelines/utilities as discussed in Section 2.2.2 would come ashore at the tip of the West Foreland and travel an additional 1.8 miles onshore to the production facility near Kustatan. Two additional pipelines are planned between the Kustatan Production Facility and the Trading Bay Facility:

- One 6-inch pipeline to carry natural gas from the Kustatan Production Facility to the Trading Bay Production Facility. The pipeline would tie into an existing natural gas pipeline between the West Forelands #1 site and the West McArthur River Unit. The use of an existing gas pipeline between West McArthur River Unit and the Trading Bay Production Facility is also being evaluated. An estimated 2.1 million standard cubic feet per day of dry natural gas will be transported at 300 psig and 100ºF. The West McArthur River Unit may have some demand for natural gas.
- One 8-inch pipeline to carry crude oil from the Kustatan Production Facility to the Cook Inlet Pipeline Company oil pipeline system located at the Trading Bay Production Facility. An estimated 25,000 barrels per day of oil will be transported at approximately 450 psig.

The pipelines would be placed in a trench adjacent to an existing access road between the Kustatan Production Facility and the West McArthur River Unit and next to existing pipelines between the West McArthur River Unit and the Trading Bay Production Facility. The line will have a nominal depth of burial of 3 feet. Appropriate bedding materials will be placed to reduce the potential for damage to the pipe. The pipeline locations were included in the original Corps of Engineers submittal for the road/pipeline route to the Tomcat Exploration Well. Access roads between the Kustatan Production Facility and the Trading Bay Production Facility currently exist.

A new access road would need to be constructed between the tip of the West Foreland and the Kustatan Production Facility. The road would be a 1.8-mile all-weather gravel road approximately 16 to 20 feet wide and 2 to 3 feet above the ground surface. The access road and pipelines would be contained within a right-of-way approximately 50 feet wide. The preliminary access road/pipeline alignment is shown on Figure 2-6.

Over half the length of the access road is located along privately owned lands. The access road would normally be used only as part of Forest Oil operations. Forest Oil intends to control access onto their lands, but access to privately held lands will be controlled by the individual landholders.

### 2.2.5 Resource Requirements

#### 2.2.5.1 Osprey Platform

The proposed project would use the existing platform for production operations and would not require any additional resources other than water as discussed in the following sections.

2.2.5.2 Underwater Pipelines and Utilities

The underwater pipelines and utilities require the use of an approximate 100-foot wide corridor on the seafloor. The total area required for the 1.8-mile long pipeline is approximately 22 acres of seafloor; it would not restrict the area's use for any other activities other than placement of other marine structures and possible vessel anchoring.

2.2.5.3 Kustatan Production Facility

As previously indicated, the proposed Kustatan Production Facility will be located on properties currently owned by Forest Oil. The property is currently developed and a minor amount of site preparation is anticipated for these facilities (estimated total size of about 10 acres).

The proposed Kustatan Production Facility will require approximately 19,000 barrels per day of fresh water. Water is planned to be obtained from deep groundwater sources accessible through the Tomcat Exploration Well. This well was drilled in the fall of 2000 and failed to demonstrate adequate reserves of oil or gas for commercial development. Instead of plugging and abandoning the well, it will be used as a water supply well, drawing water from permeable zones at depths of about 12,000 feet. There are no other users of this non-potable water source in the general area. Forest Oil has applied for appropriate water rights from the ADNR for withdrawal of water.

2.2.5.4 Onshore Pipelines

It is estimated that all access road and pipeline construction activities can be conducted within a 50-foot wide corridor. Assuming that 1.8 miles of new onshore pipeline alignment would be required, less than 10 acres of previously undisturbed upland area would be disturbed from access road construction and development of possible material sites (gravel sources). It is estimated that less than 1 acre of wetlands might possibly be disturbed (NCG 2001).

Gravel requirements for the construction pad/access road are estimated at about 36,000 cubic yards. A reconnaissance of gravel resources in the area has been conducted and several potential gravel sources have been identified adjacent to existing roads in the area. Additional gravel sources may also occur along the proposed pipeline alignment. Gravel will be purchased by Forest Oil per prior agreements from the property and subsurface owners of the materials.

Pipelines between the Kustatan Production Facility and the West Forelands #1 site would be constructed within existing access corridors.

2.2.5.5 Other Resources

Manpower requirements during construction activities are anticipated to be a maximum of 60 persons. Manpower would be housed in existing facilities at either the Osprey Platform, West McArthur River Unit Production Facility, or at the Trading Bay Production Facility.

## 2.3 Alternative 2: Offshore Pipeline to Kustatan

### 2.3.1 Osprey Platform

The configuration and operation of the Osprey Platform would be the same as for Alternative 1 (Proposed Project).

### 2.3.2 Underwater Pipelines and Utilities

Under this alternative, the pipelines/utilities would be the same as discussed for the proposed project, with the exception that the underwater segment would be 3.3 miles long instead of 1.8 miles long. With the longer pipeline length, the pipeline pull method would not be possible. Instead, the conventional lay barge approach would be required.

Side scan sonar surveys of the proposed pipeline routing discovered the presence of a significant boulder bed that will significantly impact placement of the pipeline along this route.

### 2.3.3 Kustatan Production Facility

The onshore production facility near Kustatan would be the same as for Alternative 1 (Proposed Project).

### 2.3.4 Onshore Pipelines

Under this alternative, the 1.8 miles of pipelines/utilities between the tip of the West Foreland and the Kustatan Production Facility would not be constructed; only a short pipeline (i.e., less than 1,000 feet) would be required from shore to the Kustatan Production Facility. The pipelines between the Kustatan Production Facility and the Trading Bay Production Facility would be as described above for the proposed project.

### 2.3.5 Resource Requirements

Under this alternative, the 1.8 miles of pipelines/utilities between the tip of the West Foreland and the Kustatan Production Facility would not be constructed, and the associated land and gravel resources would not be required.

The length of underwater pipeline would be expanded from 1.8 to 3.3 miles, and the associated requirements for seafloor use would increase from 22 acres (proposed project) to approximately 40 acres.

All other resource requirements under this alternative would be similar to the proposed project.

## 2.4 ALTERNATIVE 3: OFFSHORE PIPELINE TO TRADING BAY PRODUCTION FACILITY

### 2.4.1 Osprey Platform

The configuration and operation of the Osprey Platform would be generally the same for this alternative. The major difference would be that higher pressures would be required to ship fluids and gas over a distance of 10.5 miles rather than 1.8 miles as in the proposed project.

### 2.4.2 Underwater Pipelines and Utilities

Under this alternative, the pipelines/utilities would be the same as discussed for Alternative 1 (Proposed Project), with the exception that the underwater segment would be 10.5 miles long instead of 1.8 miles long. With the longer pipeline length, the pipeline pull method would not be possible. Instead, the conventional lay barge approach would be required. In this option, trenching would be the only mode considered for construction of the shore approach, as there are existing pipelines and a beach bluff cut at this location.

### 2.4.3 Kustatan Production Facility

The onshore production facility near Kustatan would not be constructed under this alternative. Instead, the Trading Bay Facility would need to be modified in order to accept fluids from the Redoubt Shoal Unit Development Project directly and to provide power for supporting the Osprey Platform. Detailed engineering has not been done to evaluate the possible scope of modifications required.

### 2.4.4 Onshore Pipelines

Under this alternative, the underwater pipelines/utilities as discussed in Section 2.2.4 would come ashore near the Trading Bay Production Facility and travel an additional 0.1 miles to the facility. All other onshore pipelines, as discussed in the previous sections, would not be constructed under this alternative.

### 2.4.5 Resource Requirements

Under this alternative, the length of underwater pipeline would be expanded from 1.8 to 10.5 miles, and the associated requirements for seafloor use would increase from 22 acres (proposed project) to approximately 128 acres.

Resource requirements for the Kustatan Production Facility and the onshore pipelines would not be required. The approximately 0.1 mile long segment of onshore pipeline near the Trading Bay Production Facility would have negligible resource requirements as it passes through existing developed industrial areas.

Manpower requirements would be generally similar to the proposed project.

## 2.5 ALTERNATIVE 4: NO ACTION

This alternative would be selected if the project economics are not favorable for production of the Redoubt Shoal Unit. This may result from insufficient hydrocarbon reserves identified during the exploration activities, or selection of alternatives that require significantly higher costs than the proposed project (Alternative 1). In the event that the No Action Alternative is selected, there would be no modifications to the Osprey Platform, and the platform would likely be removed for use elsewhere. Pipelines/utilities would not be constructed. The Kustatan Production Facility would not be constructed under this alternative. No additional resources would be required for this alternative. Oil found at the Redoubt Shoal Unit would not be produced under the No Action Alternative.

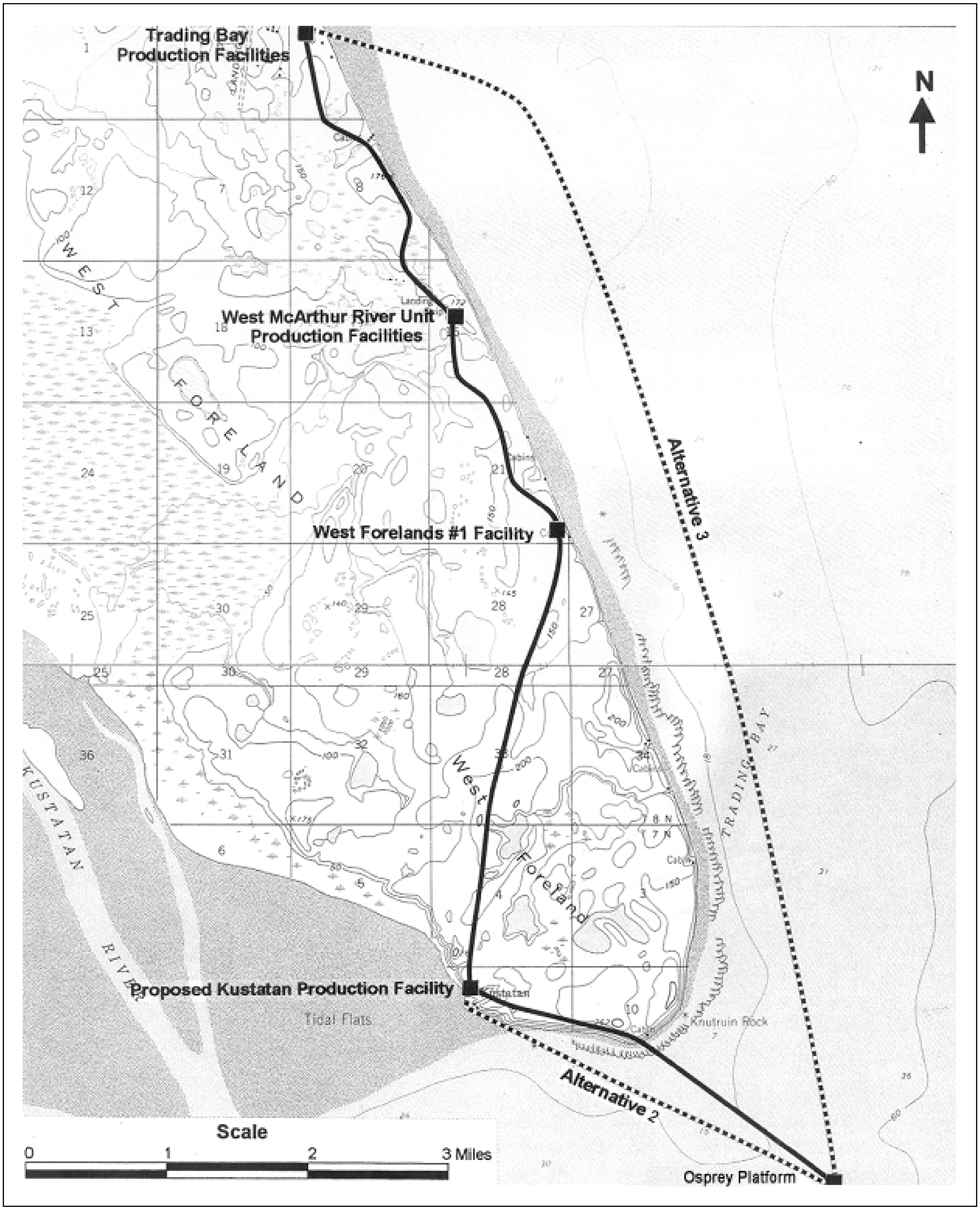



**Figure 2-1. General Vicinity Map**

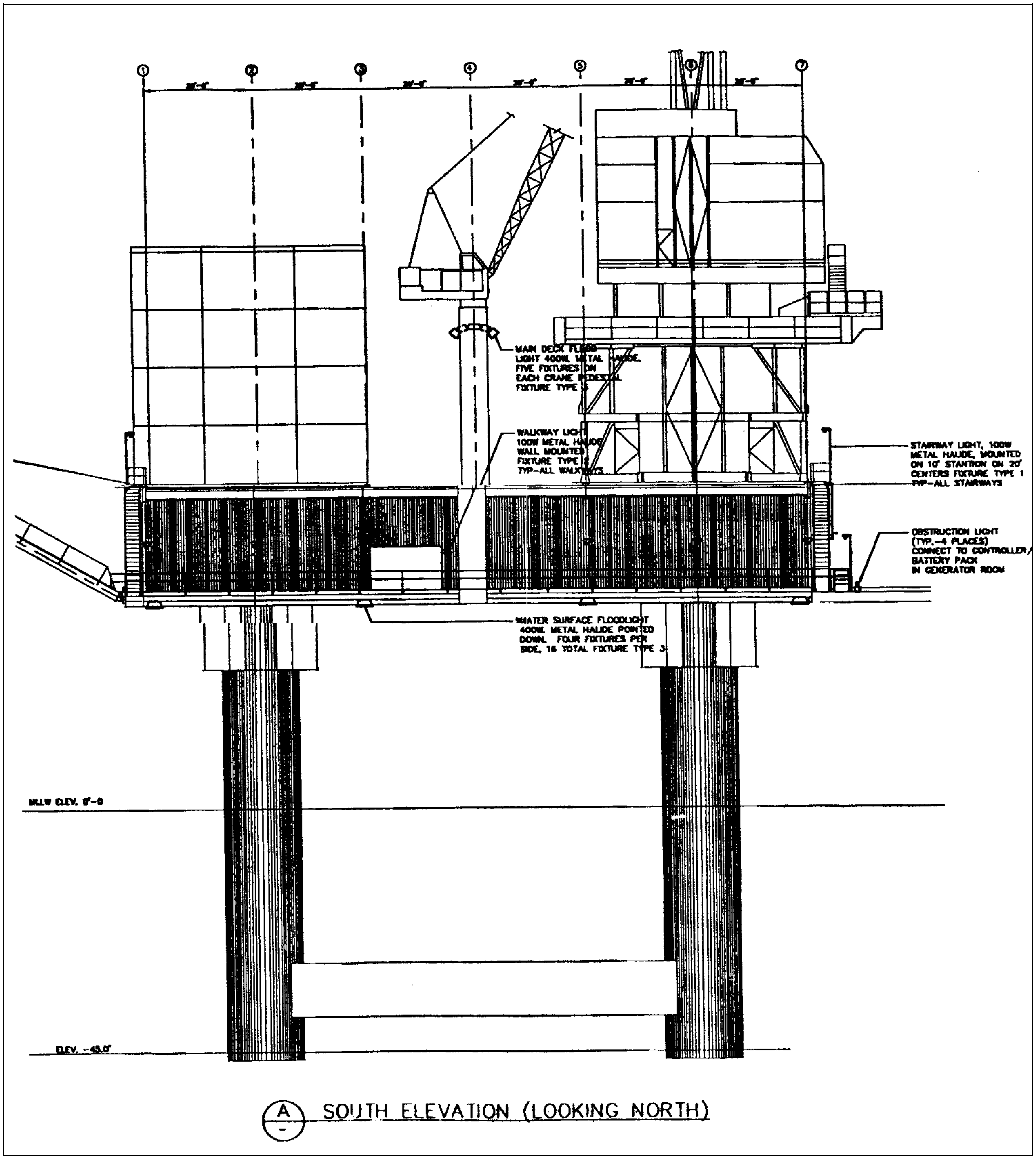
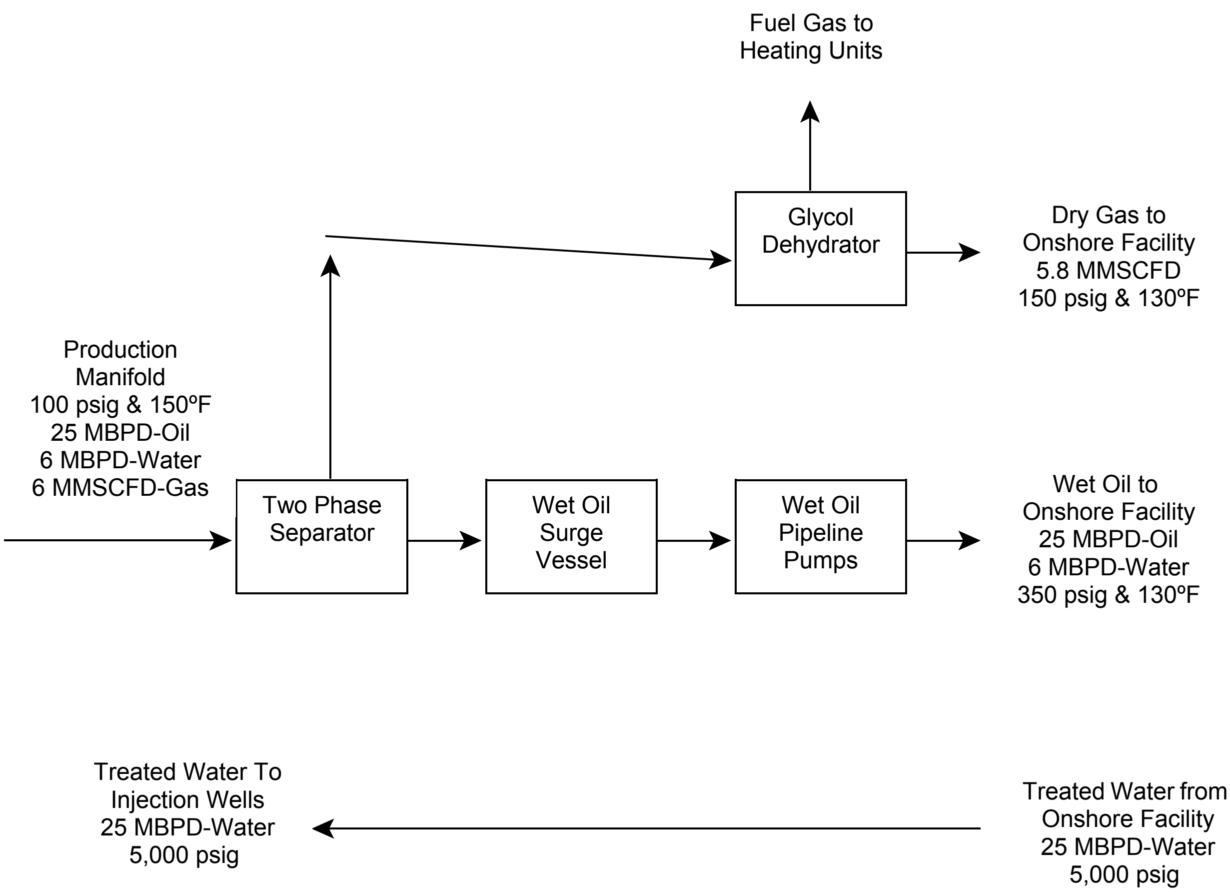



**Figure 2-2. General Schematic of the Osprey Offshore Drilling Unit**
(Source: NCG 2001)




MMSCFD – million standard cubic feet per day
MBPD – thousand barrels per day

**Figure 2-3. Process Flow Schematic for Osprey Platform Production Operations**
(Source: NCG 2001)

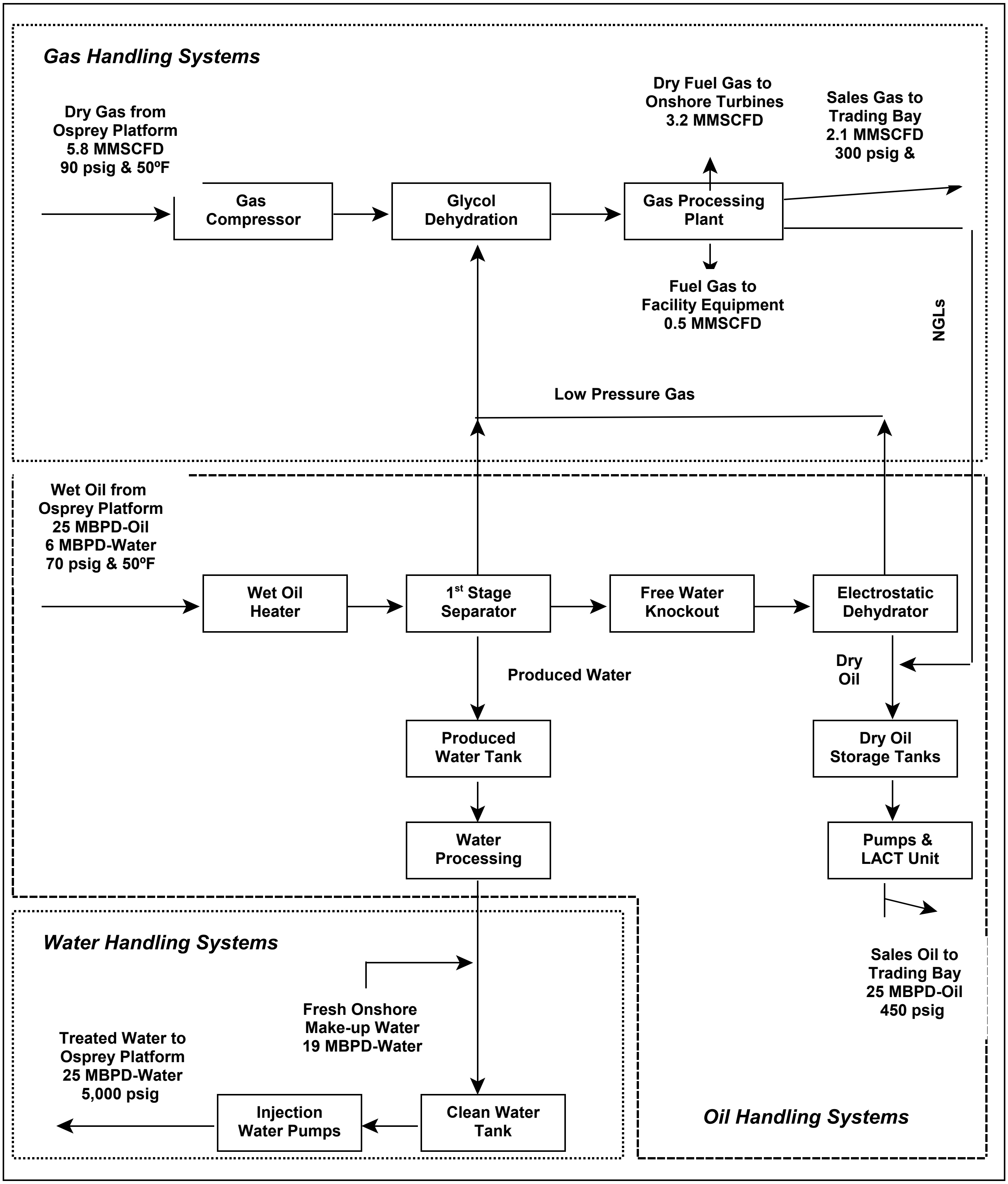



**Figure 2-4. Process Flow Schematic for the Kustatan Production Facility**
(Source: NCG 2001)

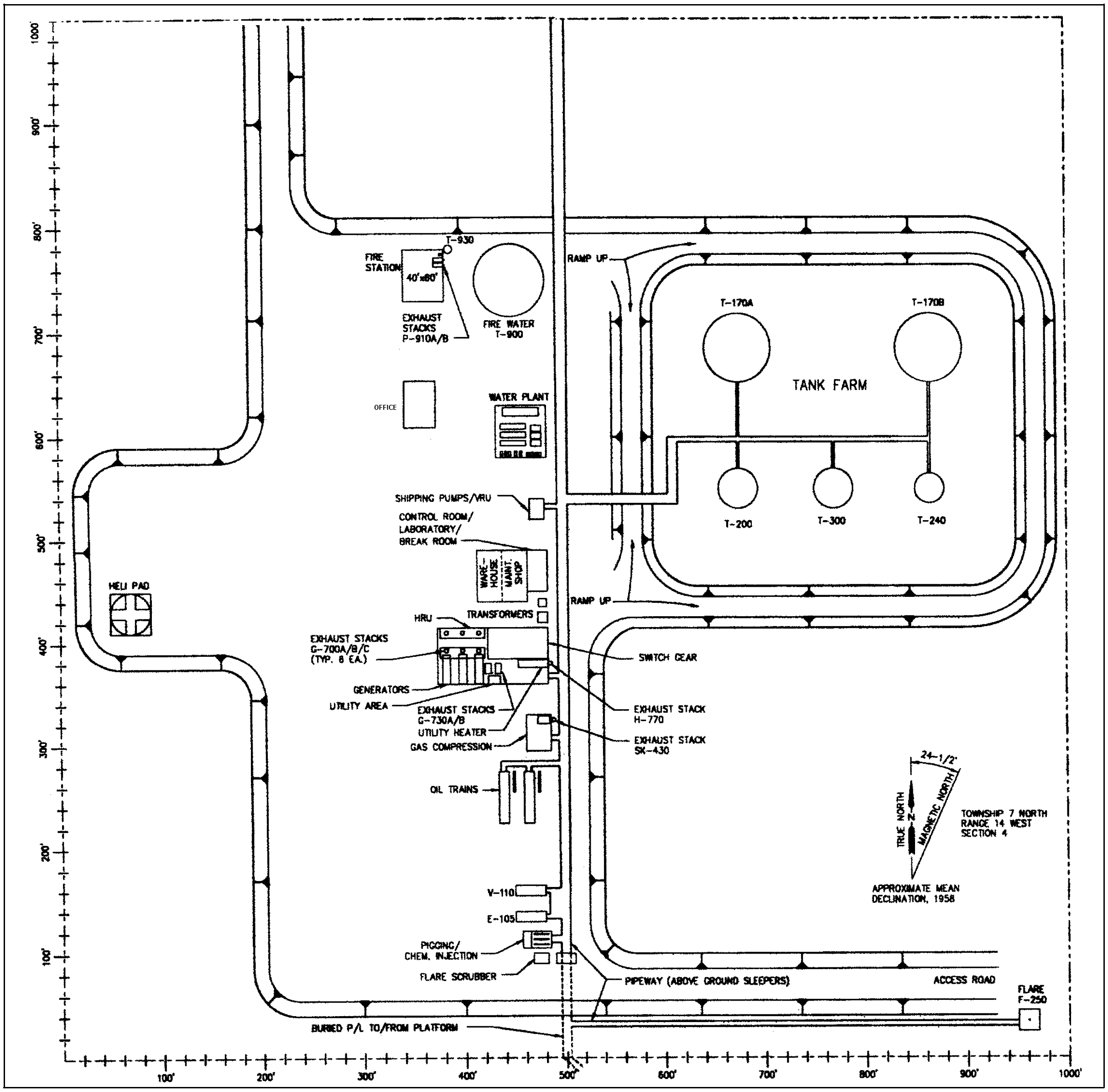



**Figure 2-5. Preliminary Site Layout for the Kustatan Production Facility**
(Source: NCG 2001)

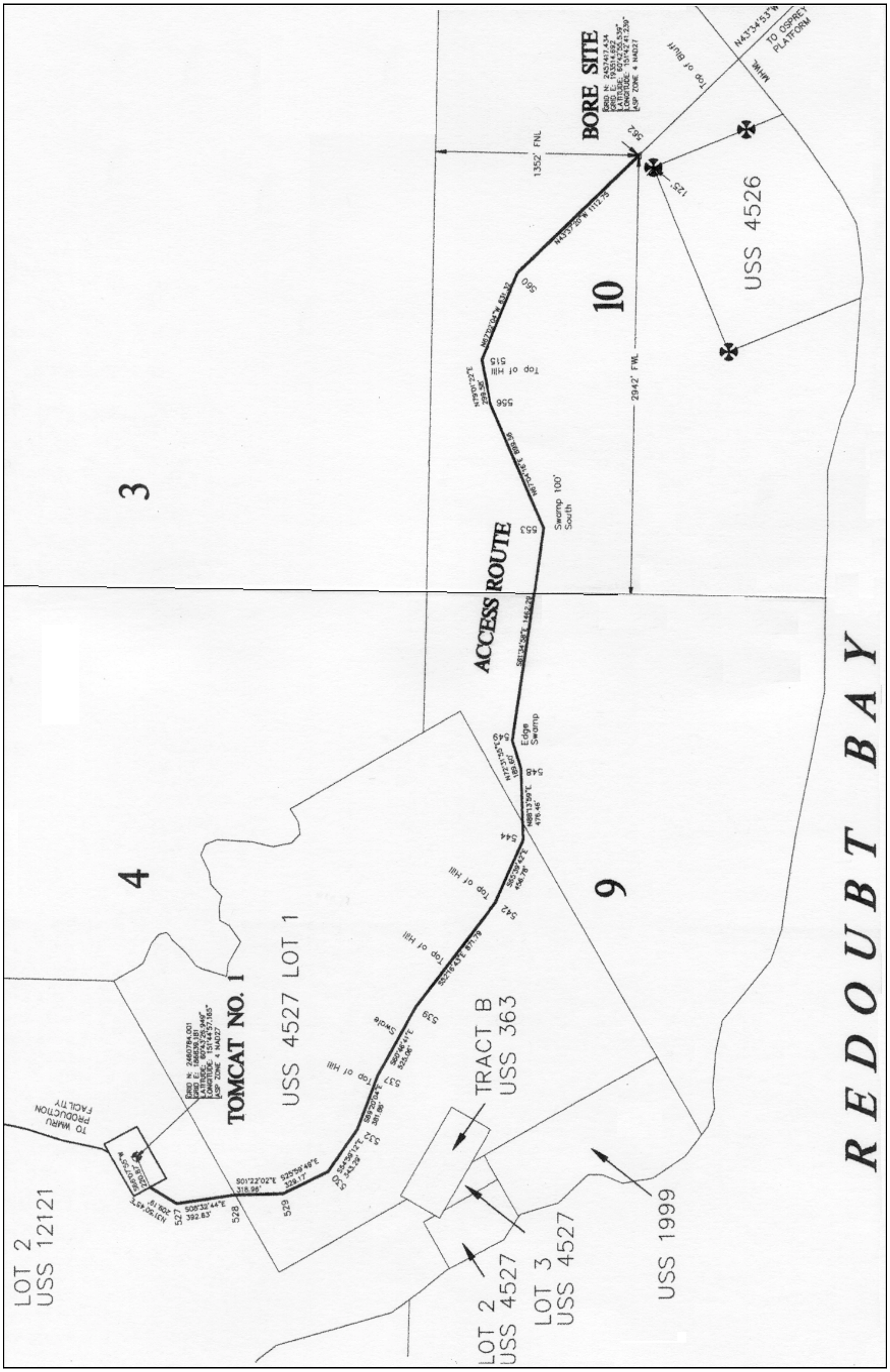



**Figure 2-6. Location of Proposed Onshore Pipeline and Access Roads**
(Source: NCG 2001)

**Table 2-1**
**Design Criteria for the Osprey Platform**

| Criteria | Value |
|---|---|
| Extreme High Water above Mean Lower Low Water | 24.2 feet |
| Extreme Low Water below Mean Lower Low Water | 6.0 feet |
| Maximum Current Speed | 13 feet/second |
| 100-Year Ice Load: | |
| Ice Thickness | 3.5 feet |
| Ice Compressive Strength | 300 psi |
| Total Load on Legs | 8,460 kips |
| Wind and Wave Criteria: | |
| Design Wind | 80 mph |
| Maximum Wind Gust | 100 mph |
| Design Significant Wave Height | 15.3 feet |
| Maximum Wave Height | 28.0 feet |
| Period of Maximum Wave | 8.5 seconds |
| Minimum Ambient Air Temperature | -20ºF |
| Minimum Ambient Water Temperature | 29ºF |
| Earthquake Design Criteria (per API RP 2A) | Zone 4 |
| Mudline Scour | -5.0 feet |

Source: NCG 2001

**Table 2-2**
**Pipeline Design Criteria**

| Criteria | Value |
|---|---|
| *Underwater Pipelines* | |
| Earthquake Design Criteria per API RP 2A | Zone 4 |
| Maximum Current Speed (Surface) | 13 feet/second |
| On-Bottom Pipeline Stability -- Pipe Grade | |
| Oil and Gas Pipelines | API 5L X42 |
| Water Injection Pipeline | API 5L X52 |
| On-Bottom Pipeline Stability -- Wall Thickness | 0.75 inches |
| Pipe Coating (Multi-Layer) | |
| Fusion Bonded Epoxy | 8 to 10 mils |
| Copolymer Adhesive | 8 mils |
| Polyethylene Shield | 100 to 125 mils |
| Allowable Spans (to minimize vortex shedding) | |
| Gas Pipeline | 23 feet |
| Oil and Water Injection Pipelines | 26 feet |
| *Onshore Pipelines* | |
| Earthquake Design Criteria per API RP 2A | Zone 4 |
| Minimum Burial | 3 feet |

Source: NCG 2001

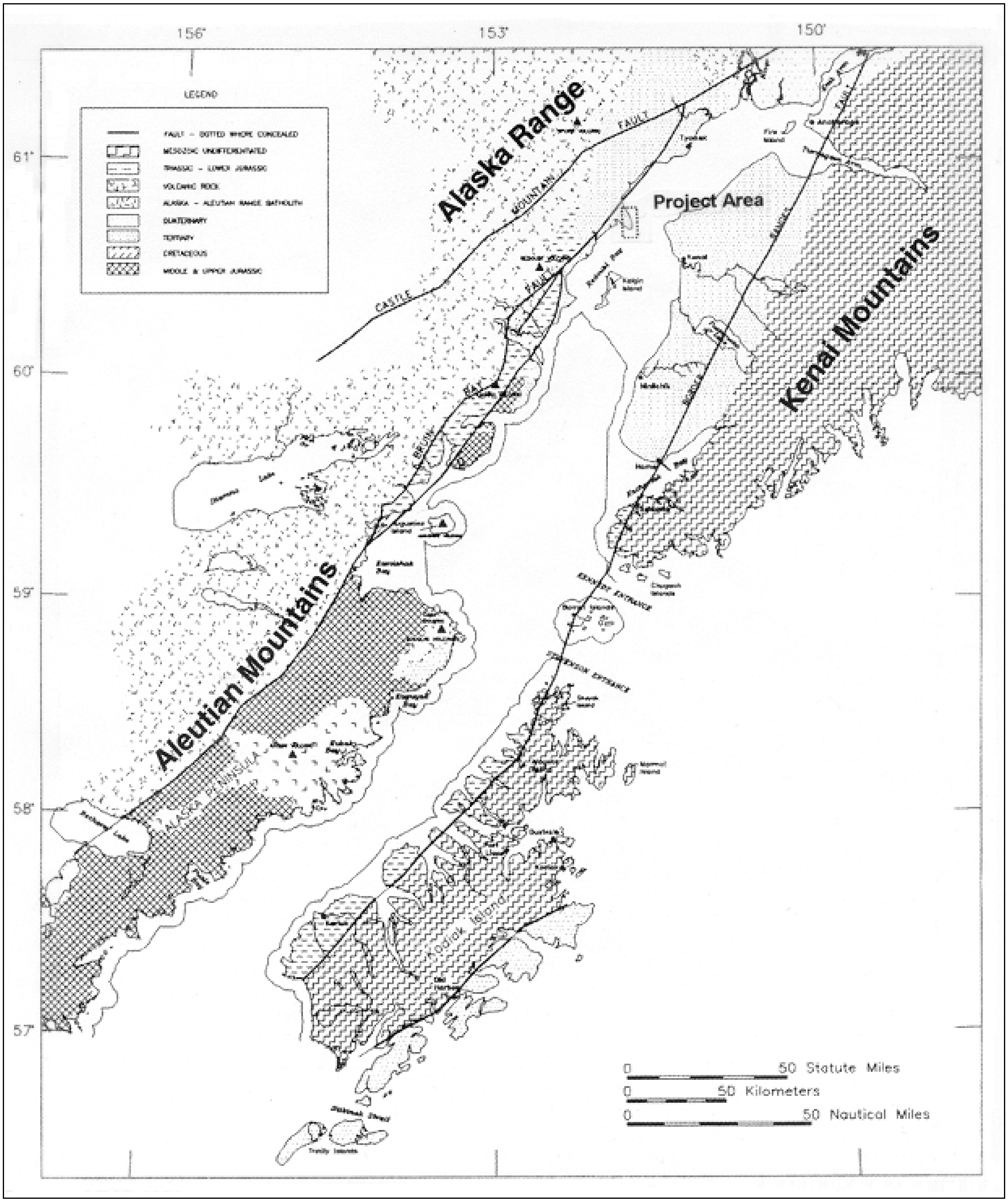



**Figure 3-1. General Geological Setting for the Cook Inlet Area (Source: MMS 1996b)**

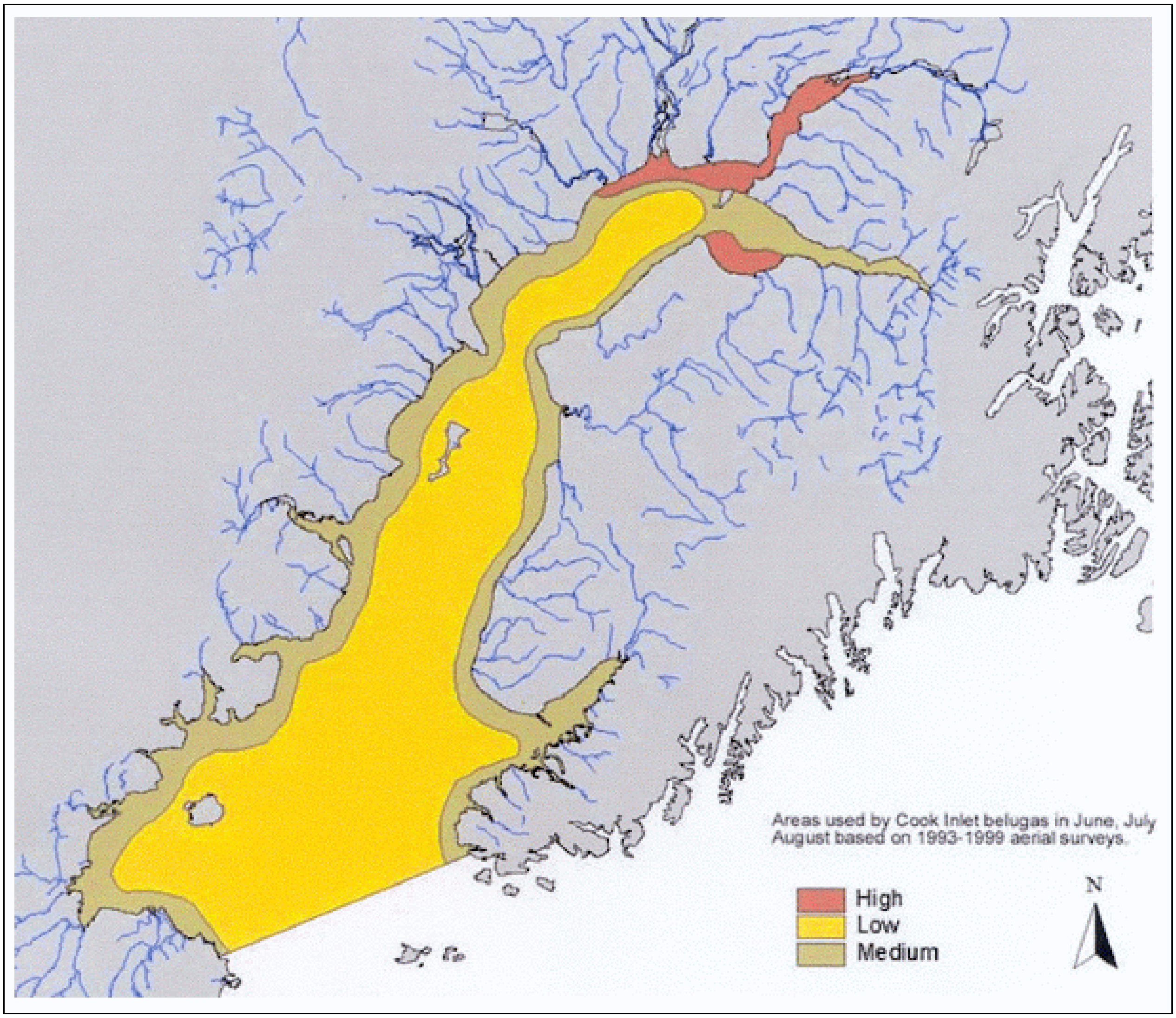



**Figure 3-2. General Concentrations of Beluga Whales in Cook Inlet (Source: NMFS 1999)**

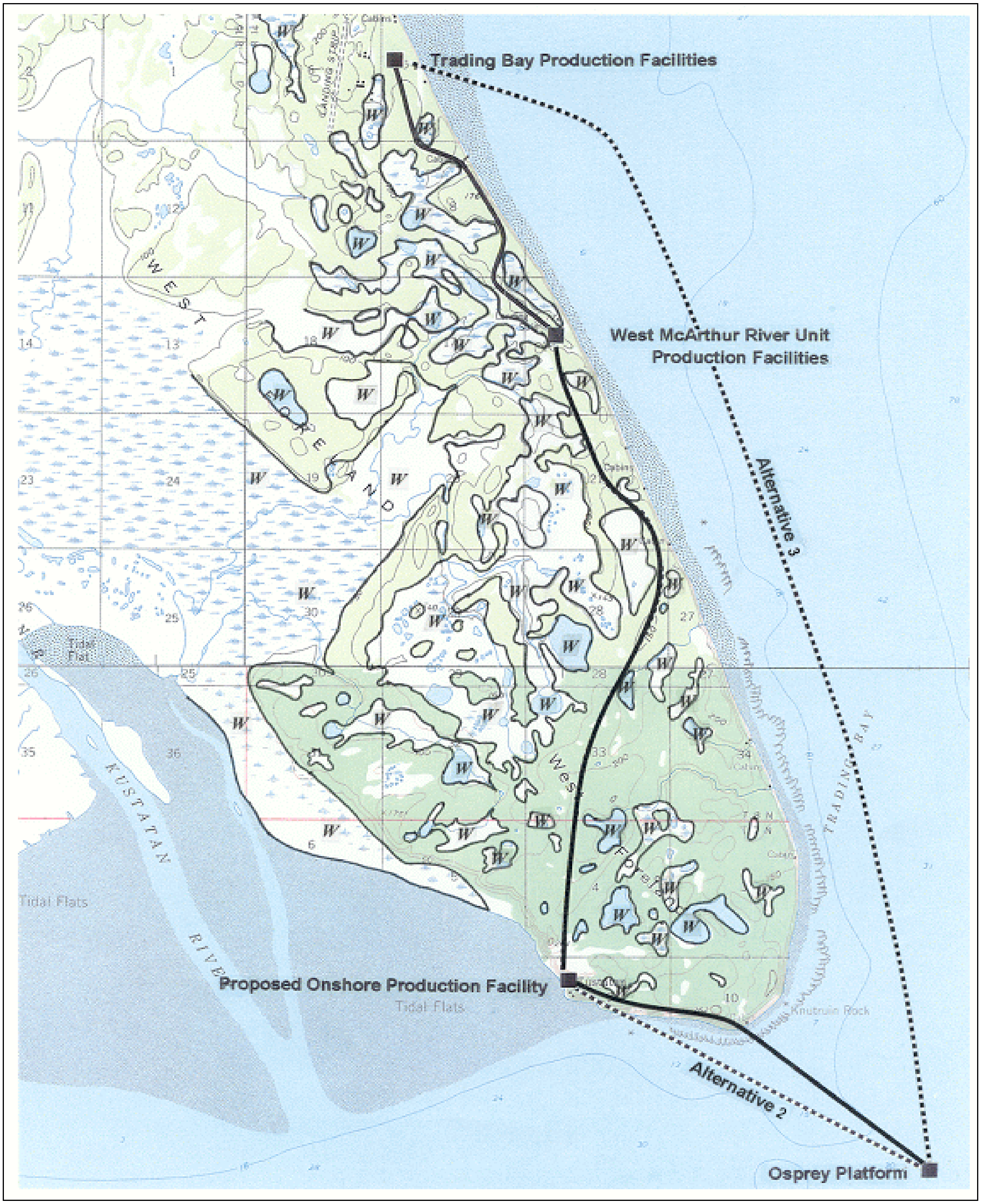



**Figure 3-3. Generalized Map of Wetlands in the West Forelands Area**

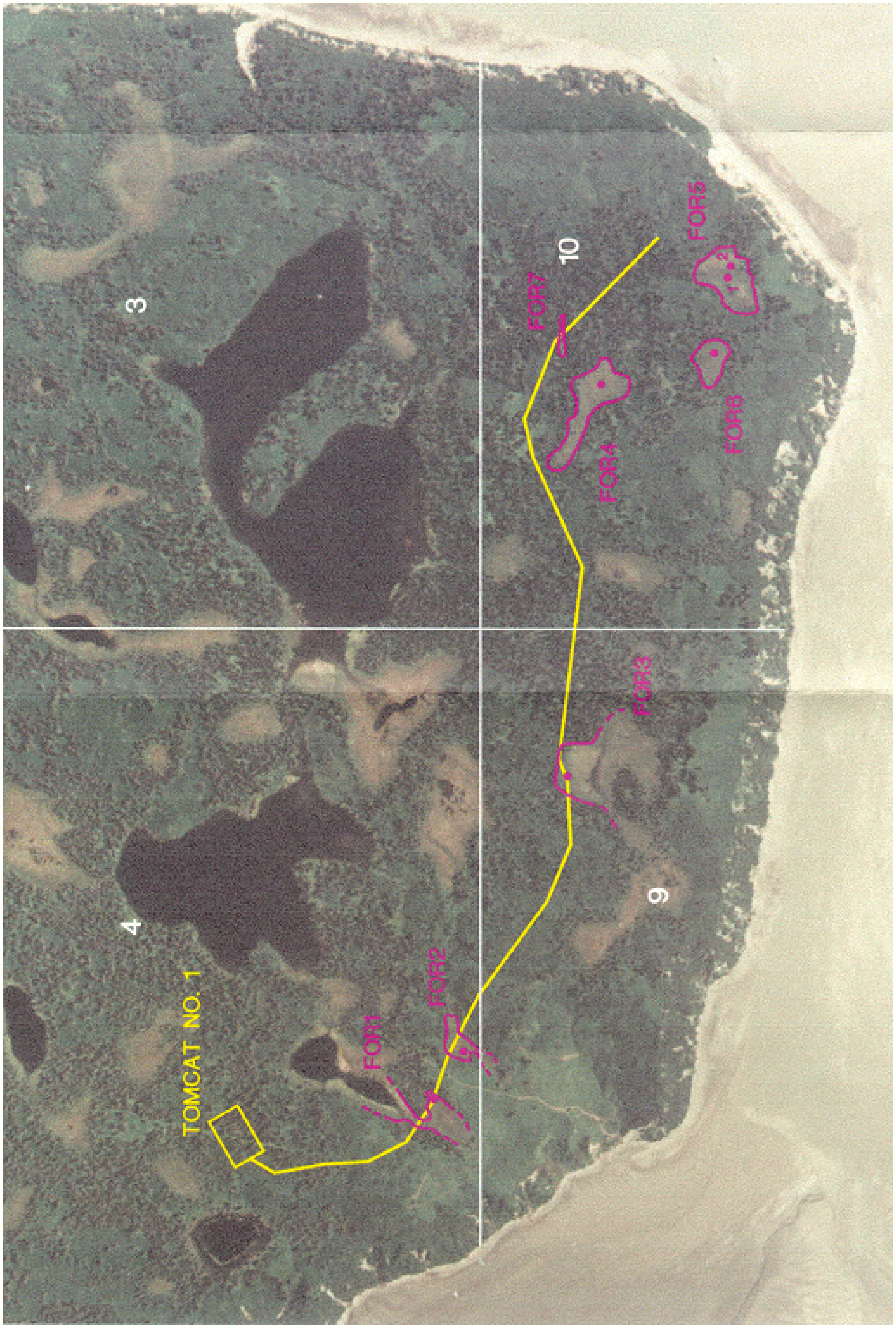



**Figure 3-4. Map of Wetlands Along the Proposed Access Road (Source: HLA 2000)**

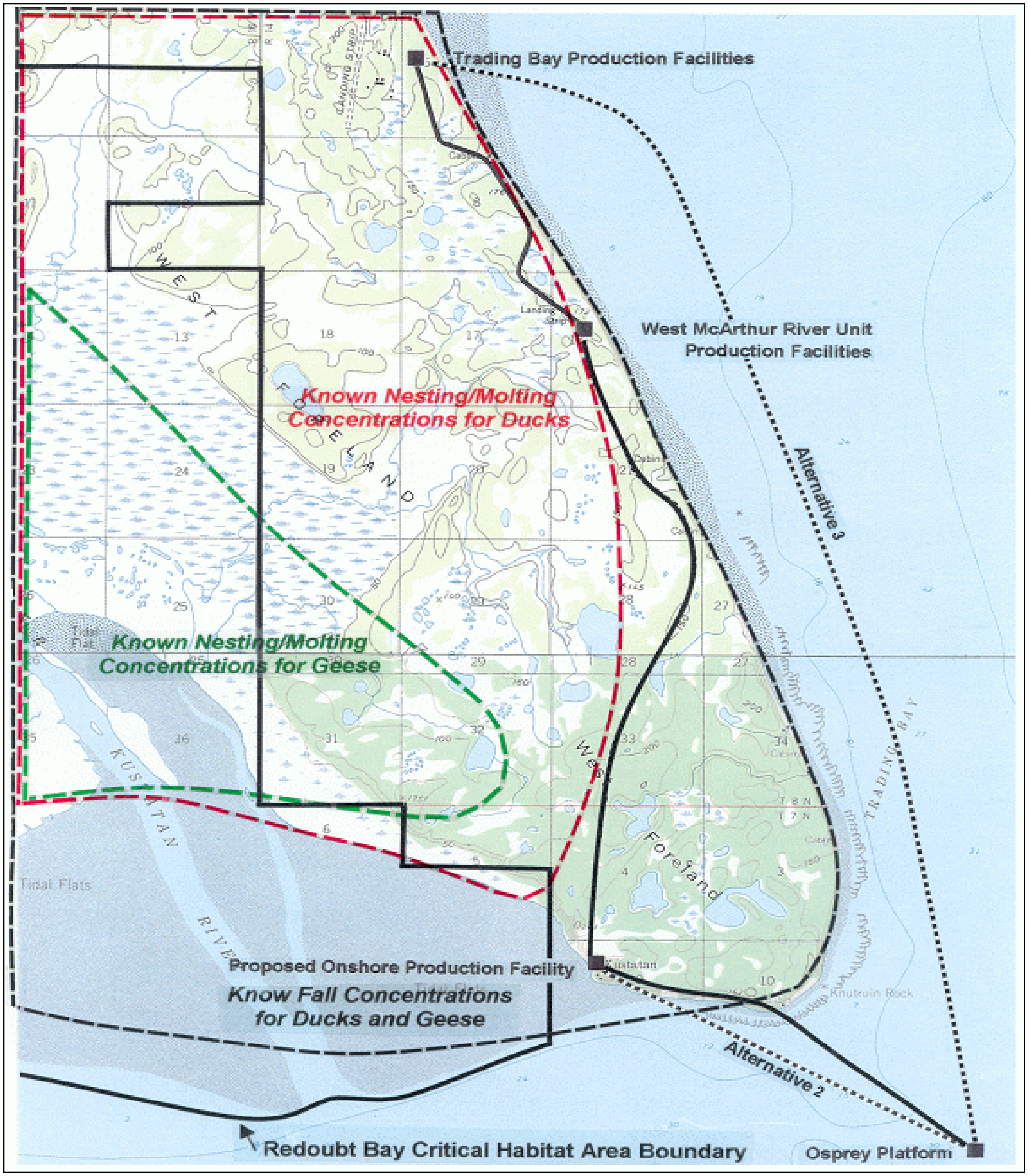



**Figure 3-5. Concentrations of Ducks and Geese in the West Foreland Area**

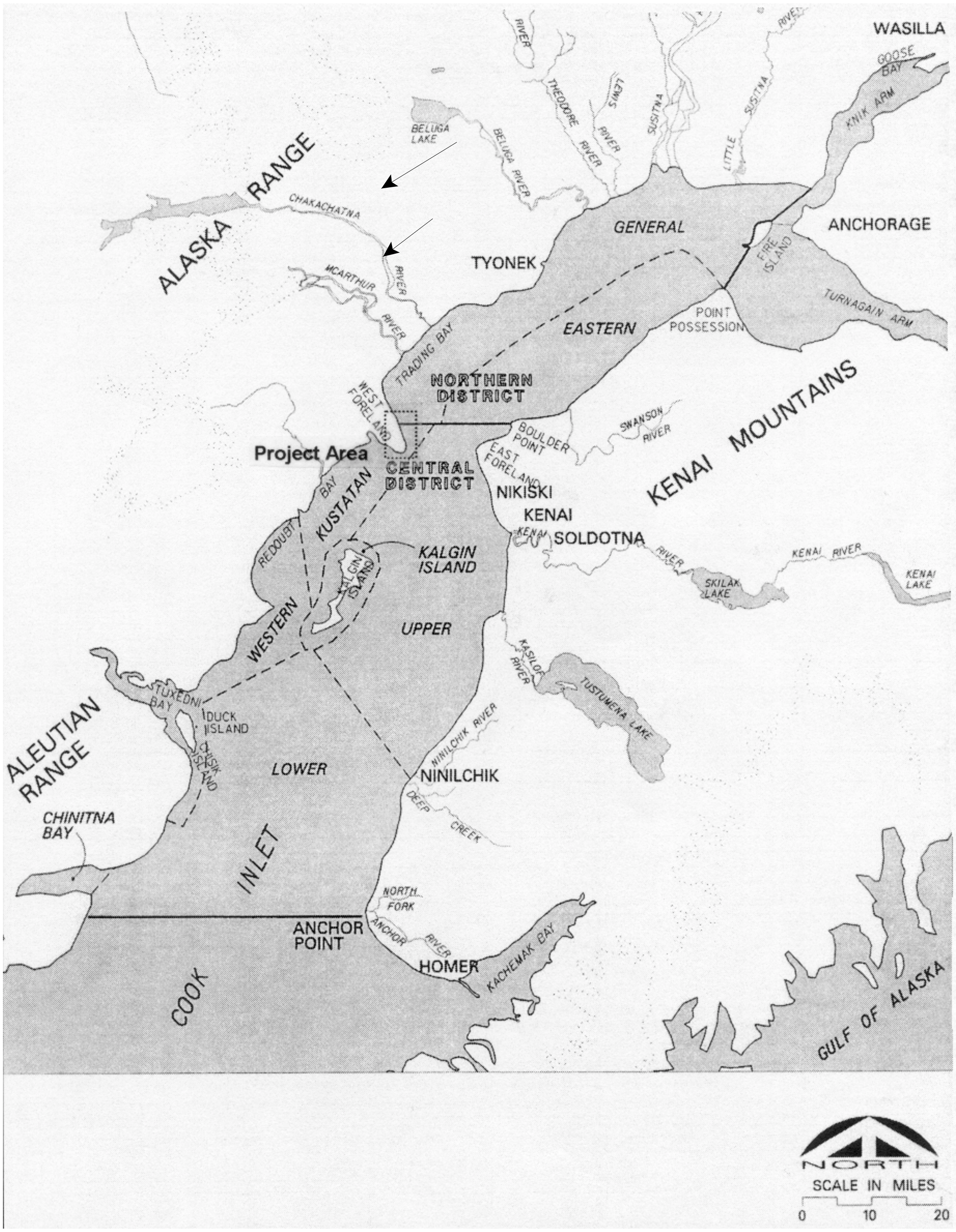



**Figure 3-6. Commercial Fishing Areas In Central and Upper Cook Inlet**

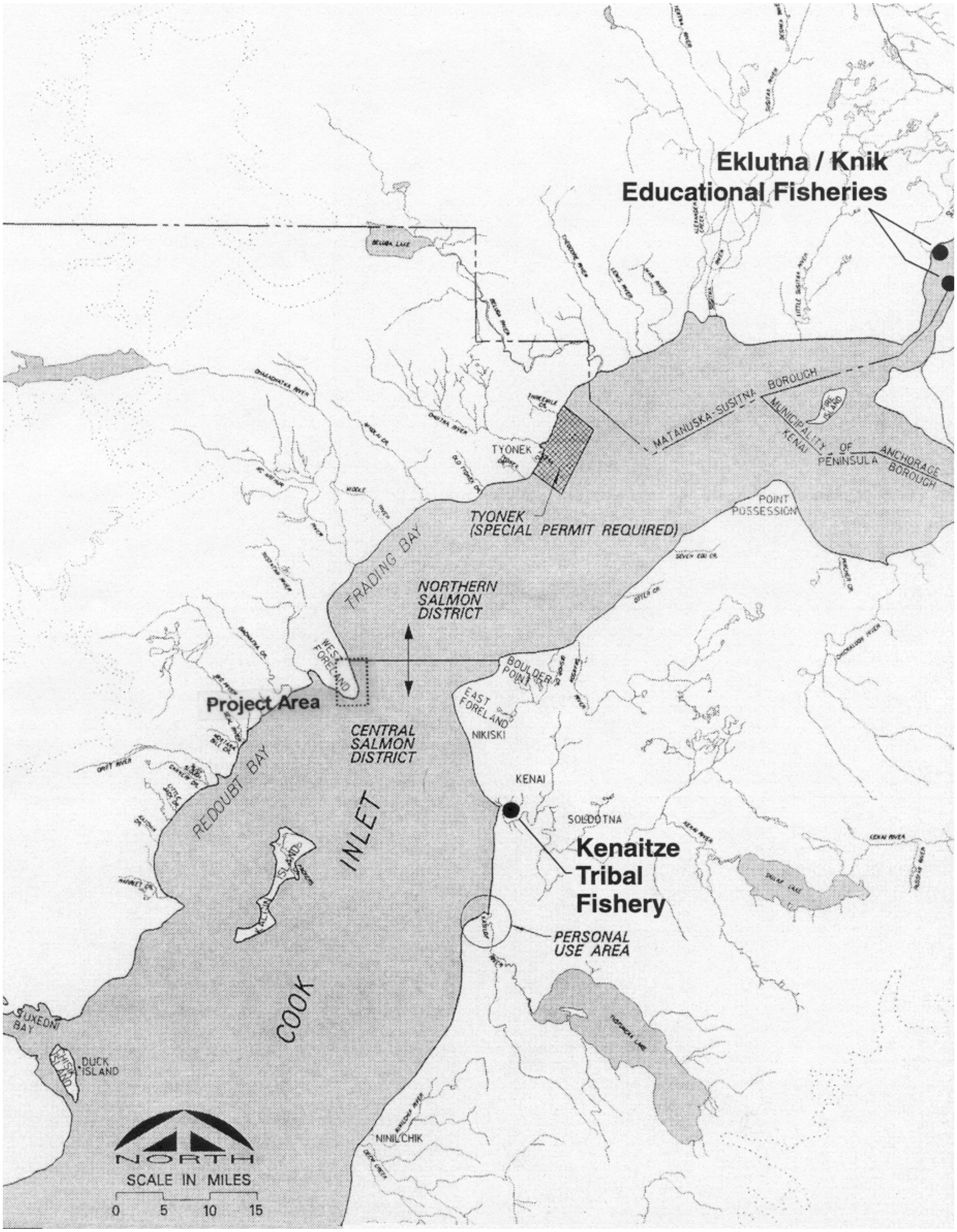



**Figure 3-7. Location of Special Fisheries in the Cook Inlet Area**

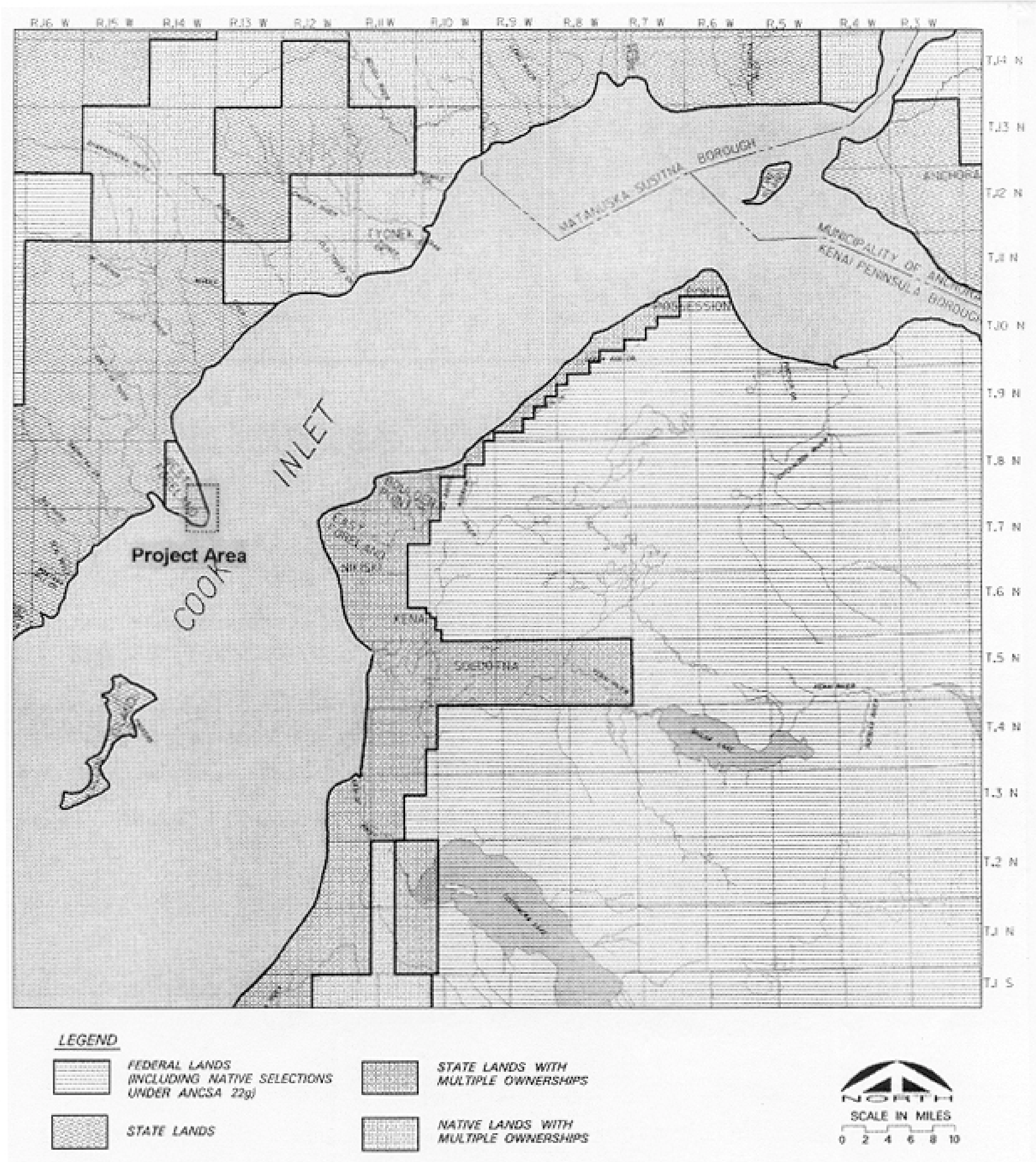



**Figure 3-8. General Land Status Map in the Upper Cook Inlet**

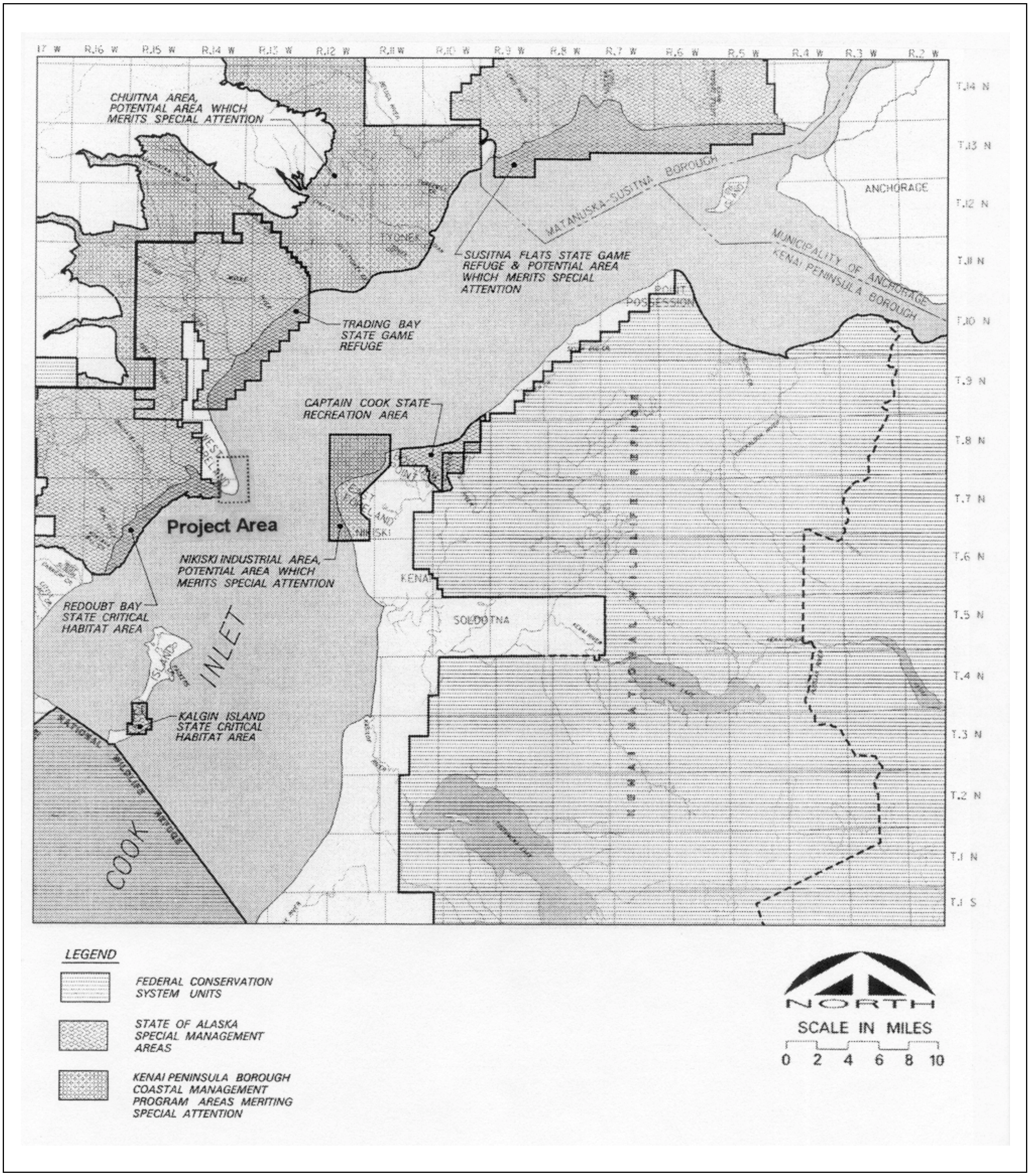



**Figure 3-9. Special Management Areas in the Upper Cook Inlet**

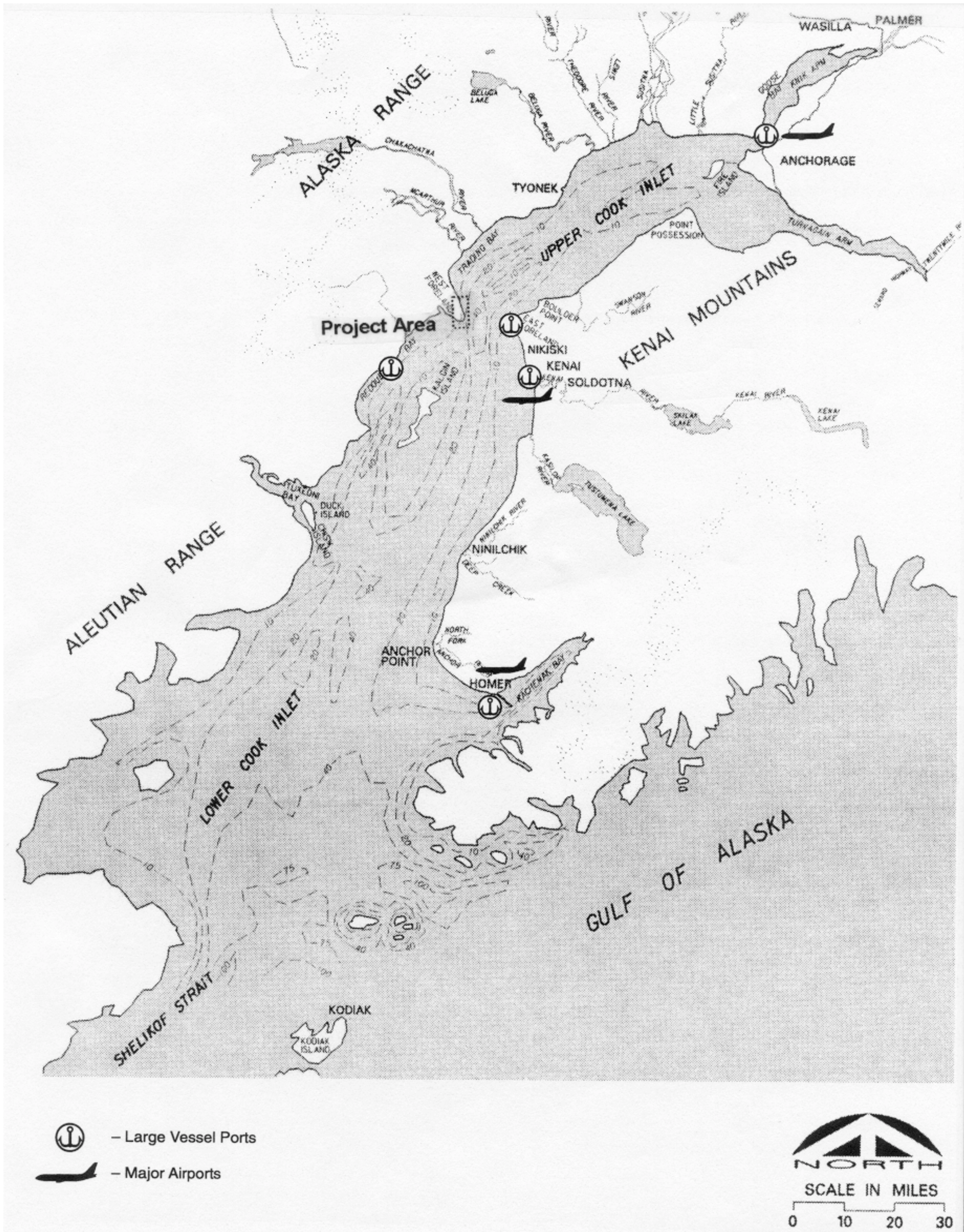



**Figure 3-10. Transportation Infrastructure in the Cook Inlet Area**

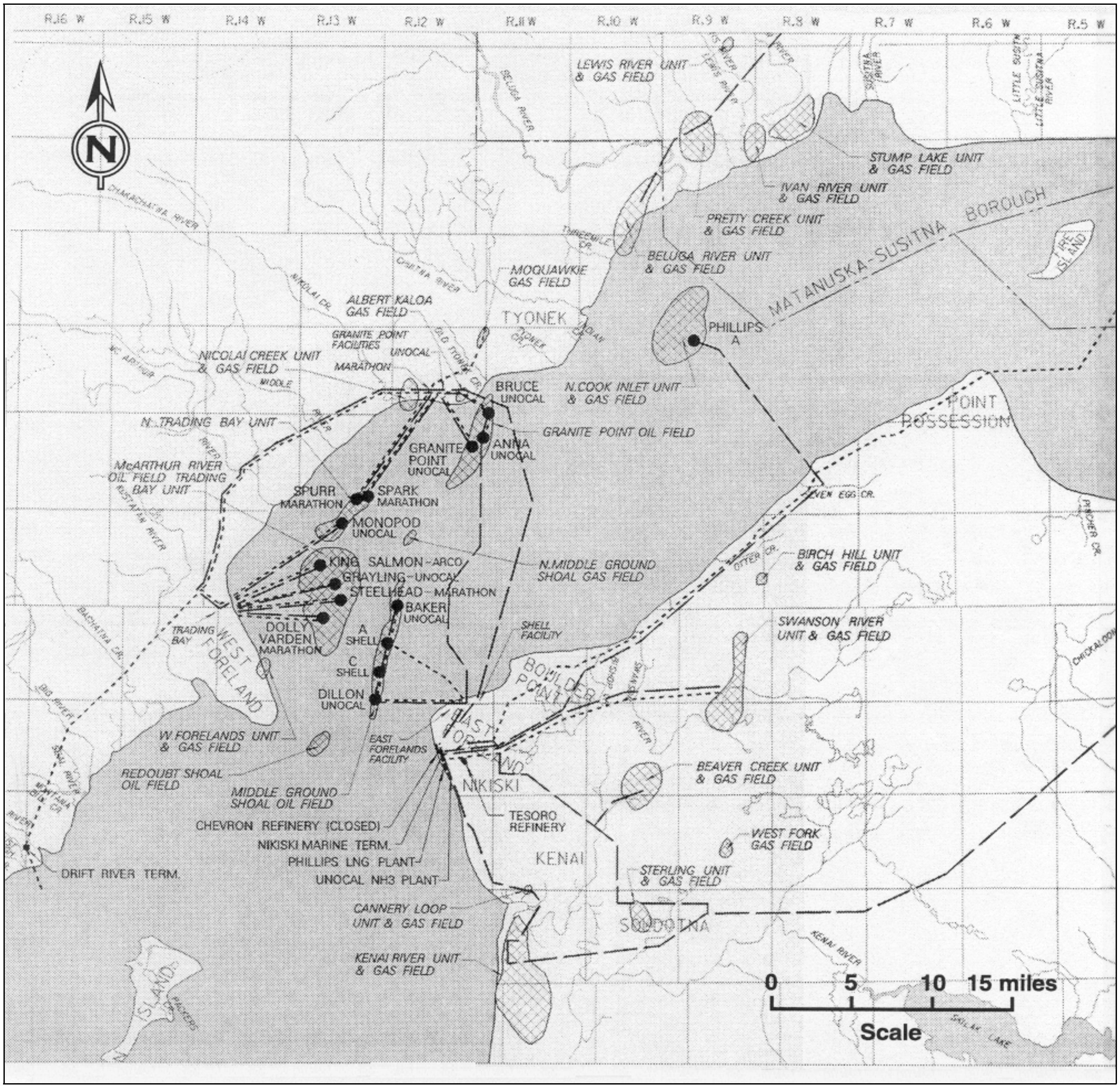



**Figure 3-11. Oil and Gas Infrastructure in Central and Upper Cook Inlet**

# 4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

## 4.1 INTRODUCTION

This section addresses potential environmental consequences for each of the project alternatives identified in Section 2. Four phases of project activities have been identified: construction; normal operations; closure; and accidents and/or natural disasters. Potential environmental impacts associated with construction, normal operations, and accidents (including oil spills) are specifically addressed in this EA.

Each subsection includes a discussion of potential environmental consequences associated with the proposed project and alternatives, along with a discussion of cumulative impacts and mitigation measures. Project activities during each phase are described below.

### 4.1.1 Construction

For the proposed project, the construction phase includes the conversion of the Osprey Platform from exploratory to production operations, construction of underwater and onshore pipelines, and construction of a new onshore production facility near Kustatan. Conversion of the Osprey Platform includes the installation of production equipment on the platform. Construction of the 1.8-mile underwater pipelines and utilities will be conducted using the pipe pull method. The pipelines will be buried near the shore and will be brought onshore by trenching and cutting through the bluff. The technical feasibility of placing the pipeline through an augured hole adjacent to the beach bluff (rather than trenching and cutting through the bluff) is currently being evaluated. Onshore pipelines and an access road will be constructed from the bluff about 1.8 miles through an area containing wetlands and archaeological resources to an onshore production facility. The proposed onshore facility will be located on property owned by Forest Oil.

Under Alternative 2, a 3.3-mile underwater pipeline would be installed using the lay barge method. The pipeline would come onshore near the proposed production facility. Under Alternative 3, a 10.5-mile underwater pipeline would be installed using the lay barge method. A 0.1-mile onshore pipeline would be constructed near the Trading Bay production facility. The Kustatan Production Facility would not be constructed. Under Alternative 4, no construction would occur. The Osprey Platform would be floated away to another location; existing exploratory wells would be sealed and abandoned.

Potential construction impacts specific to each impact area are discussed in Sections 4.2 through 4.16.

### 4.1.2 Normal Operations

Impacts during normal production operations include those related to permitted discharges from the Osprey Platform, as well as ongoing and routine air emissions and noise from the platform (Alternatives 1, 2, and 3) and the Kustatan Production Facility (Alternatives 1 and 2). Under Alternative 4, no production operations would occur. Potential impacts during normal operations specific to each impact area are discussed in Sections 4.2 through 4.16.

### 4.1.3 Closure

Closure activities include removal of the Osprey Platform, abandonment of pipelines, and closure/reclamation of the production facility. Potential environmental impacts associated with closure activities are not specifically addressed in this EA. Appropriate environmental review will be conducted in the future when a site-specific closure plan is submitted.

### 4.1.4 Accidents and Natural Disasters

The most significant potential environmental impacts associated with accidents and natural disasters result from releases of oil and gas to the water, land, and air. Oil spills can result from pipeline leaks and/or pipe failure (both onshore and in Cook Inlet), accidents on the Osprey Platform, accidents related to the onshore production facility, and other causes such as collisions with vessels. Natural disasters include earthquakes and volcanism; however, environmental impacts related to natural disasters would result primarily from releases of oil and gas. Releases of diesel fuel and other potentially toxic materials could also occur.

There have been no reported failures (i.e., leaks or ruptures) at any of the onshore pipelines in Cook Inlet (Belmar 1993). However, a number of failures of the Cook Inlet underwater pipelines have occurred. Pipeline failures have been caused by current-induced vibration (e.g., vortex shedding), riser failures, pipeline rubbing, damage from ice scour, and minor flange leaks. All 15 reported pipeline failures due to current-induced vibration occurred on unsupported pipeline spans of about 100 feet or more (Belmar 1993). The pipeline design criteria for the proposed project specify maximum allowable spans of 26 feet to minimize the potential for current-induced vibration failures. A number of pipeline riser failures due to external corrosion have occurred in Cook Inlet. At least one pipeline failure occurred due to rubbing of the pipeline on an exposed rock. Internal and external monitoring, as well as a SCADA monitoring and control system, will be utilized on the proposed project to minimize the potential for these types of failures. Unburied pipelines on the west side of Cook Inlet have occasionally been damaged by ice floes (Belmar 1993). Burial of the proposed pipelines in the intertidal area will minimize potential ice damage.

Pipeline damage from anchors in Cook Inlet would normally occur in areas of large vessel traffic, particularly in the immediate vicinity of major port facilities where anchoring is sometimes required for maneuvering or for holding while awaiting dock space. The proposed pipelines are not located in either a normal large vessel traffic lane or in the vicinity of a major port facility. The normal shipping lanes for large vessel traffic would be in the main channel of Cook Inlet located east of the Osprey Platform; larger vessels operating in the Inlet would avoid the shallower water depths in the general pipeline area.

Potential spills and leaks from operations onboard the Osprey Platform could include a diesel tank rupture, a production well blowout, or minor spills associated with resupply operations by support vessels. Spills and leaks could also occur at the Kustatan Production Facility. Potential spill sources include oil and produced water tank ruptures as well as pipeline failures.

Major spill sources and potential volumes are identified in Table 4-1 for the proposed project. Smaller spills are much more likely and could have volumes ranging from a few gallons to 1000 barrels.

Although the Osprey Platform is not in the Alaska Outer Continental Shelf (OCS), OCS statistics on oil spills were evaluated as the operations are similar (NCG 2001). During exploration in OCS waters from 1982 to 1991, 52 exploration wells were drilled with five spills greater than one barrel; the total spillage from these events was 45 barrels (MMS 1996b). From these data, MMS determined a spill rate of 11 spills per 100 exploratory wells with an average spill size of 9 barrels.

Spills would probably be more frequent during production operations, but the spill size would likely be small (MMS 1996b). Between 1971 and 1980, the spill rate for Cook Inlet was 265 spills per billion barrels produced and transported. The average size of these spills was 4.4 barrels, and none of the spills was greater than 1,000 barrels (MMS 1996b).

In OCS producing areas between 1970 and 1992, there were 1,812 spills in the range of one to less than 50 barrels while producing 7.7 billion barrels of crude oil and condensate. This equates to a spill rate for these smaller spills (1 to <50 barrels) of 234 spills per billion barrels produced with an average spill size of 5 barrels (MMS 1996b). In OCS producing areas from 1964 to 1992, the offshore-oil industry spilled 14,000 barrels in 88 spills in the range of 50 to less than 1,000 barrels while producing 8.96 billion barrels of crude oil and condensate (MMS 1996b). This equates to a spill rate of 9.8 spills (in the 50 to <1,000-barrel range) per billion barrels produced with an average spill size of 160 barrels (MMS 1996b). For spills greater than 1,000 barrels, the average spill rates for platforms were 0.60 spills per billion barrels produced, and for pipelines were 0.67 spills per billion barrels produced (MMS 1996b). The average spill sizes for platform and pipeline spills were 18,000 and 22,000 barrels, respectively.

Although the exact oil reserves for the Redoubt Shoal Unit Development Project are not known, Forest Oil estimates it is between 25 and 50 million barrels (NCG 2001). Table 4-2 summarizes the potential oil spill risk for the proposed project based on the above MMS statistics.

Additional statistics are also available from an industry-sponsored risk assessment for Cook Inlet operations (PLG 1990). Spill rates from various activities were developed; extrapolating these spill rates over a conservative project life of 30 years leads to the following predictions for the proposed project (NCG 2001):

- Platform spills > 50 barrels: 0.42 spills
- Underwater pipeline rupture/leak: 0.039 spills
- Onshore pipeline rupture/leak: 0.14 spills

These estimates are consistent with the oil spill potential for the proposed project calculated from MMS statistics (Table 4-2). Based on a conservative estimate of a 30-year project duration, 0.087 spills are predicted for the underwater pipeline under Alternative 2 (offshore pipeline to Kustatan) and 0.27 spills are predicted for the underwater pipeline under Alternative 3 (offshore pipeline to Trading Bay), based on statistics presented by PLG (1990). For the onshore pipeline, 0.1 spills and 0.028 spills are predicted for Alternatives 2 and 3, respectively, over a 30-year project life (NCG 2001).

Potential impacts related to oil and gas spills specific to each impact area are discussed in Sections 4.2 through 4.16.

### 4.1.5 Cumulative Impacts

Oil and gas exploration and development projects have been conducted in the Cook Inlet area since the late-1950s onshore and since the mid-1960s offshore. At present, there are 14 offshore oil and gas production platforms and over 500 miles of underwater pipeline in the upper Cook Inlet and associated onshore facilities along the shores of the inlet. There is also associated marine transport of both crude oil and refined products within the inlet waters. In general these operations have been declining over the past several decades with the reduced oil production in the Cook Inlet area.

The proposed activities would include operation of one additional offshore production platform, placement of about 7 additional miles of underwater pipeline (3 pipelines) and construction of one additional onshore production facility. Within the context of existing regional conditions, these would be neither unusual nor add significantly to potential cumulative effects from oil and gas operations in the Cook Inlet area. Activities from the project may tend to slightly offset effects of reduced oil production in the region by providing direct and indirect employment opportunities to local communities.

Potential cumulative impacts specific to each impact area are discussed in Sections 4.2 through 4.16.

#### 4.1.5.1 Environmental Impacts from the Oil and Gas Industry

During the four decades that oil and gas operations have been conducted in the Cook Inlet area, oil spills and other releases have occurred. A number of area-wide studies have been conducted to assess possible cumulative impacts from oil and gas operations in the Cook Inlet area.

A recent study was conducted by the Cook Inlet Regional Citizens Advisory Group (CIRCAC). CIRCAC, a citizen's oversight council for oil industry operations in the Cook Inlet region, was established according to Section 5002 of the Oil Pollution Act of 1990. One of the CIRCAC mandates is to conduct monitoring to assess environmental impacts of oil industry operations in Cook Inlet. To this end, CIRCAC initiated an environmental monitoring program that has been conducted annually since 1994. The program generally includes monitoring of hydrocarbon concentrations in marine sediments, the water column, and in marine organisms to assess the general health of Cook Inlet. CIRCAC's most recent report (Lees et al. 1999) lists the following conclusions:

*Sediment Hydrocarbon Levels:*

- Sediment samples had extremely low levels of polynuclear aromatic hydrocarbons (PAHs).
- The sources of hydrocarbons were varied and mixed, but could not be directly attributed to Cook Inlet oil and gas development operations.
- There was no evidence of the *Exxon Valdez* Oil Spill (EVOS) or Alaska North Slope (ANS) oil observed in any of the subtidal sediments in the Cook Inlet area.
- Sediments did not contain concentrations of hydrocarbons which would cause mortality or sublethal effects to organisms.

*Marine Organism Tissue Hydrocarbon Burdens:*

- Subtidal organisms living in the region exhibited no indication of accumulation or exposure to high levels of hydrocarbons from Cook Inlet oil and gas activities.
- In a few instances, minimal exposure of intertidal organisms was indicated:
    1. Extremely weathered EVOS residues plus fresh diesel were encountered in mussels at one site in Shelikof Strait.
    2. Mixtures of diesel and very low-level combustion-derived (pyrogenic) hydrocarbons were noted in tissues of *Macoma balthica* from Tuxedni Bay.
    3. Fresh oil seep signals (from natural sources) were possibly observed in tissues of *Macoma balthica* from Chinitna Bay.

*Water Column Hydrocarbons:*

- Deployment of caged mussels near produced water discharge outfalls generally failed to show any evidence of PAH accumulation, although this could have been due to extreme stress in the deployed mussels due to high suspended-particulate loads or other environmental factors.
- Evidence of a produced water PAH signal was observed in the Trading Bay area, and what was presumably a weathered diesel signal was observed in Kachemak Bay.

*Hydrocarbon Sources:*

- Subtidal coal outcrops or river-borne particulate coal from terrestrial sources may contribute significant levels of PAH to the sediments throughout the region.
- Total naphthalenes/total PAH ratios tend to increase with sand-sized particulates suggesting a particulate coal-derived source for much of the PAH observed in the sediments.
- Samples from the Kenai River show a PAH signature similar to samples from other areas of the inlet. These upriver samples from terrestrial sources most likely represent erosion of coal deposits in the watershed area.
- Very few of the low-level PAH signatures for either sediments or tissues could be directly tied to specific sources; the samples suggested either undocumented sources or mixtures from multiple sources.

Lees et al. (1999) concluded, based on the overwhelming weight of evidence, that hydrocarbon contamination or effects related to hydrocarbon exposure are either lacking or, if observed, occur at levels very near the detection limits. Observations indicated no evidence of contamination from oil activities in Cook Inlet or effects that could be related to hydrocarbon concentrations in the sediment. The only methodology that exhibited a relevant response was placement of arrays of organisms near a produced water discharge in Trading Bay. Other approaches exhibited responses to environmental factors, but did not exhibit a significant correlation with petroleum hydrocarbons (e.g., effects associated with oil and gas operations in Cook Inlet).

#### 4.1.5.2 Other Projects That Could Contribute to Cumulative Impacts

A number of other projects are currently in various stages of planning and/or development in the Cook Inlet region. These are listed on Table 4-3 and their locations shown on Figure 4-1. Projects that are currently proposed or recently completed that are within the immediate project area (i.e., within a 10-mile radius of the proposed project) include:

***Forest Oil's Tomcat Onshore Exploration Drilling Project.*** The Tomcat Exploration Drilling Project included the construction of an access road between the West Forelands #1 site and a drilling location in the general vicinity of the proposed onshore production facility near Kustatan. The access road was built during the summer of 2000, and subsequent drilling activities were conducted in the fall of 2000. Based on the recently-completed drilling activities, commercial reserves were not identified and therefore further development of the Tomcat Project will not occur.

The proposed project will use the existing concrete pad for construction of the Kustatan Production Facility, and will use the access road for the Tomcat Exploration Drilling Project. Pipelines will be placed alongside the access road. The existing drilling site and other infrastructure developed as part of the Tomcat Project will be used for the proposed project to the extent possible. This includes conversion of the existing Tomcat exploration well to a deep groundwater well to provide makeup water for pressure maintenance in the Redoubt Shoal Unit.

Two pipelines are planned between the onshore production facility and the Trading Bay Production Facility:

- One 6-inch pipeline to carry natural gas from the onshore production facility to the Trading Bay Production Facility. The pipeline would tie into an existing natural gas pipeline between the West Forelands #1 site and the West McArthur River Unit. The use of an existing gas pipeline between West McArthur River Unit and the Trading Bay Production Facility is currently being evaluated (NCG 2001). An estimated 2.1 million standard cubic feet per day of dry natural gas will be transported at 300 psig and 100ºF. The West McArthur River Unit may use some of the natural gas.
- One 8-inch pipeline to carry crude oil from the onshore production facility to the Cook Inlet Pipe Line Company oil pipeline system located at the Trading Bay Production Facility. An estimated 25 thousand barrels per day of oil will be transported at approximately 450 psig.

The pipelines will be placed in a trench adjacent to the existing access road between the proposed onshore production facility and the West McArthur River Unit and next to existing pipelines between the West McArthur River Unit and the Trading Bay Production Facility. The line will have a nominal depth of burial of 3 feet. Appropriate bedding materials will be placed to reduce the potential for damage to the pipe. The pipeline locations were included in the original Corps of Engineers submittal for the road/pipeline route to the Tomcat exploratory well location.

***UNOCAL's Cross Inlet Oil Pipeline.*** A cross-inlet oil pipeline has been examined at least once in the past, and was determined to be uneconomical. UNOCAL's current project is still in the conceptual/economic evaluation stage, and preliminary information suggests there is limited support for the project. Chances that this project will proceed are considered low (i.e., less than 50 percent; NCG 2001).

***ARCO's Alaska North Slope LNG Project.*** The Alaska North Slope LNG Project includes construction of a natural gas pipeline to either Nikiski (Cook Inlet area) or to Anderson Bay (Port Valdez/Prince William Sound area). Similar gas pipeline projects have been proposed numerous times in the past, and all have been found to either be uneconomic or lack gas markets. Chances that this project will proceed with a terminal at Nikiski is considered low (i.e., less than 50 percent; NCG 2001).

***Other Projects in the Cook Inlet Area***. The following projects in the Cook Inlet area are believed to have a high likelihood of occurring within the foreseeable future (or are currently in progress):

- Marathon's Wolf Lake Gas Project
- Anadarko/Phillip's Lone Creek Gas Project
- Matanuska-Susitna Borough's Point Mackenzie Port Development
- Corps of Engineer's Knik Arm Dredging Project

Both the Wolf Lake and Lone Creek projects involve production of onshore gas reserves. As they are both onshore gas projects located more than 10 miles from the proposed project, cumulative impacts from these projects is considered unlikely.

The Knik Arm Dredging Project and the Point Mackenzie Port Development are ongoing projects; major construction activities were scheduled to be completed in 2000. Both projects are located in the Knik Arm area, some 60 to 70 miles from the proposed project location. As such, cumulative impacts from these two projects are not anticipated.

The remaining Cook Inlet area projects listed on Table 4-1 are either distant from the proposed project location, have an undefined scope, and/or are believed unlikely to proceed at least within the near future (next 5 years).

## 4.2 GEOLOGY AND SOILS

Potential environmental impacts associated with geology and soils include: offshore sediment disturbance during pipeline placement; onshore terrain disturbance during construction of the onshore pipeline and production facility; gravel requirements for construction of the access road; and geologic hazards that could cause an oil or gas spill. Sections 4.2.1 through 4.2.3 describe potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are described in Section 4.2.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.2.5 and 4.2.6, respectively.

### 4.2.1 Impacts During Construction

Potential construction impacts related to geology and soils include nearshore and offshore sediment disturbance during pipeline placement, onshore terrain disturbance during construction of the onshore pipeline and production facility, and use of gravel resources for construction of the access road.

#### 4.2.1.1 Nearshore Sediment Disturbance

The proposed project assumes that the nearshore pipeline will be placed by trenching through the intertidal/shallow subtidal area. The pipe trench will be constructed from a 150-foot barge using either a backhoe or clamshell, with a production rate of approximately 10 cubic yards per minute. Calculations made by Forest Oil (NCG 2001) indicate that while the trench is being constructed, it will remove seafloor sediments at a rate of about 4.5 $ft^3$/sec (10 $yd^3$/min). The total area or volume of nearshore sediment disturbance is not known, but impacts are likely to be short-term and minor. Increased turbidity is likely to result from trenching operations. Impacts on water quality associated with turbidity during construction are discussed in Section 4.5, Marine Water Quality.

An alternate method for nearshore pipeline placement is auguring through the intertidal/shallow subtidal area. Augering would be conducted from the top of the bluff, and therefore impacts on nearshore sediments would be avoided. An engineering evaluation of whether augering is a technically viable option has not been completed by Forest Oil (NCG 2001).

#### 4.2.1.2 Offshore Sediment Disturbance

The underwater pipeline can be placed using pipe pulling operations or a lay barge. Common offshore pipe pulling operations include assembly of the pipeline onshore and pulling the pipeline out to the platform. As sections of the line are welded and inspected, the pipeline is pulled towards the platform through the use of a temporary winch system at the platform. A barge may be required at the platform location to assist with pulling operations. In shallower water, pipelines may be placed in trenches constructed using backhoes or clamshells. The proposed project does not include burial of offshore portions of the pipeline, but does include burial of the shore approach using either track or barge-mounted backhoes to a water depth of -10 feet MLLW.

The pipe pull method is viable only for the proposed project. Impacts associated with pipe pull operations would include bottom disturbances due to the effects of the pull cables and pipelines physically being dragged on the seafloor. Estimated impacts from this operation would be limited to a seafloor corridor about 50 feet wide, for a total disturbed seafloor area of about 10 to 12 acres. Increased turbidity could also occur near the seafloor. The duration of disturbance using this method is expected to be on the order of several days (Amundsen 2000b). Overall, these effects would be short-term and minor.

The pipe lay barge methods is viable for the proposed project, and is the only technically feasible means to construct either Alternative 2 or 3. Impacts associated with use of a pipe lay barge would include physical disturbances to the seafloor resulting from dragging a stinger (frame structure that guides the lines from the lay barge to the seafloor) across the seafloor, and from placement and setting of the large anchors necessary to position the lay barge. It is estimated that eight anchors would be required on the barge (Amundsen 2000b). Anchors would be periodically repositioned as the barge moves offshore, and actual seafloor disturbance would result as the anchor cables are pre-tensioned. Seafloor impacts would likely not cover a larger area per unit distance than the pipe pull method, but effects would be spread out over a corridor possibly 1,000 to 2,000 feet wide (primarily due to anchoring). Increased turbidity could also occur near the seafloor. The duration of disturbances using this method is expected to be about one week (Amundsen 2000b). Associated impacts to the marine environment are expected to be both short-term, as recolonization of the disturbed substrate would rapidly occur.

4.2.1.3 Onshore Terrain Disturbances

Terrain disturbances will result from construction of an access road and pipelines through 1.8 miles of undisturbed area from the bluff at the West Foreland to the proposed Kustatan Production Facility. Potential impacts are primarily on wetlands and terrestrial habitat and are discussed in Section 4.9 (Terrestrial Biological Resources).

4.2.1.4 Gravel Resources Required

Approximately 29,000 cubic yards of gravel will be required to construct the proposed production pad, and 7,000 cubic yards will be required to construct the 1.8-mile access road between the Kustatan Production Facility and the tip of the West Foreland. Gravel resources have tentatively been identified by Forest Oil on Native-owned land near the general area (NCG 2001). Some positive benefits will accrue to the Native landowners from the sale of gravel, and any adverse impacts are expected to be minor.

### 4.2.2 Impacts During Normal Operations

No potential environmental impacts related to geology and soils due to normal operations have been identified.

### 4.2.3 Accidents and Natural Disasters

Potential impacts related to accidents and natural disasters include damage during seismic events, volcanic eruptions, and other geological hazards.

The proposed project lies within a region of high seismic activity; however, there are no known active faults located at any of the onshore or underwater facilities or pipelines. The Osprey Platform is designed to withstand anticipated API Zone 4 earthquake loadings (NCG 2001). The proposed new pipelines will also be designed to meet or exceed stringent seismic design criteria for the region. Subsequently, potential impacts from seismic activity are considered to be negligible, given current design technology.

Volcanoes may occur some time during the 20-year life of the proposed project. Eruptions and ash clouds normally would require the platform and production facilities to shut down operations while this condition exists. Ash falls are not considered a major danger; however, the abrasive and corrosive effects could be a nuisance to oil and gas operations (Hampton 1982). In addition, lava flows, pyroclastic, or debris flows should be considered a potential hazard to any coastal facilities located near an active volcano (MMS 1995).

Other geological hazards that can pose engineering challenges to facilities and pipelines include liquefaction, landslides, debris flow, rock falls, or other forms of soil instability. These conditions are not known to occur in the project area. As such, these factors would result in no impacts.

High currents in Cook Inlet may result in the formation of wave-like bottom features, which are somewhat mobile and could create long spans of unsupported pipe and therefore increase the risk of pipeline failure. Impacts related to pipeline failure are discussed in Section 4.4 (Physical Oceanography) and Section 4.5 (Marine Water Quality).

If a high pressure natural gas deposit is encountered during drilling, a blowout could occur, resulting in releases of oil and gas to the marine environment. Environmental impacts related to blowouts are discussed in Section 4.5 (Marine Water Quality).

Due to the stringent design criteria, and the relatively unlikely event of a major natural disaster during the life of the project, potential environmental impacts from the proposed project related to geological hazards are considered minor.

### 4.2.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Potential impacts associated with construction activities would be comparable to the proposed project, with the exception that the underwater pipeline would be 3.3 miles, rather than 1.8 miles. Thus, a larger area of the seafloor would be disturbed during pipe lay barge operations. Pipe trenching activities would result in similar impacts as for the proposed alternative. Construction impacts associated with Alternative 2 are expected to be short-term and minor. The potential for pipeline damage and subsequent releases of crude oil to the marine environment are greater for Alternative 2 than for the proposed project. Side scan sonar surveys of the pipeline routing for Alternative 2 discovered the presence of a significant boulder bed (NCG 2001) that would significantly impact placement of the pipeline along this route. In addition, the underwater pipeline for this alternative is 80 percent longer than the proposed project. Gravel requirements for Alternative 2 (offshore pipeline to Kustatan) will be less than 29,000 cubic yards to construct the proposed production facility pad. This is comparable to and somewhat less than the gravel requirements for the proposed project, and therefore impacts are believed to be minor.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Potential impacts associated with construction activities would be comparable to the proposed project, with the exception that the underwater pipeline would be 10.5 miles, rather than 1.8 miles. Thus, a larger area of the seafloor would be disturbed during pipe lay barge operations. Pipe trenching activities would result in similar impacts as for the proposed alternative. Impacts associated with Alternative 3 are expected to be short-term and minor. The potential for pipeline damage and subsequent releases of crude oil to the marine environment are greater for Alternative 3 than for the proposed project. The 10.5 mile pipeline is significantly longer than for the proposed project; no surveys have been performed along this route and therefore the risks are unknown.

Alternative 3 (offshore pipeline to Trading Bay) would involve minimal gravel requirements and would result in negligible impacts.

***Alternative 4 (No Action).*** No seafloor would be disturbed or turbidity generated under this alternative. No pipelines would be constructed under this alternative; therefore there is no potential for pipeline damage. Alternative 4 (the no action alternative) would have no associated impacts.

Potential environmental impacts related to geological hazards are similar for Alternatives 2 and 3, and are believed to be negligible to minor. Alternative 4 (no action) would result in no environmental impacts due to geological events.

#### 4.2.5 Cumulative Impacts

Because impacts to soil and sediment would occur on a very localized level (e.g., in the immediate project vicinity), the contribution of the proposed project to cumulative impacts on soil/sediment is negligible. In the event of a major geologic event (e.g., earthquake, volcanic eruption), potential releases from the proposed project could contribute to overall environmental impacts in the Cook Inlet region. However, given that there are currently 15 other offshore oil and gas production platforms and supporting operations (including 500 miles of underwater pipeline) in the upper Cook Inlet, the proposed project (one platform, 7 additional miles of pipeline) would not add significantly to the potential cumulative effects from a major geologic event.

#### 4.2.6 Mitigation Measures

The following mitigation measures will minimize the potential for environmental impacts related to geology and soils:

- Preplacement side-scan sonar and shallow sub-bottom geophysical surveys to avoid boulder or rocky areas to the extent possible.
- Shallow borings to determine whether the intertidal segment can be placed by boring (preferred) rather than by trenching.
- Use of current industry standards for pipelines/utilities in locations such as Cook Inlet.
- Burial of the pipeline in the intertidal and shallow subtidal areas.
- Use of periodic side scan sonar surveys (at least every 2 years) to inspect the integrity of the pipelines and conduct remedial actions (typically sandbagging) if potential problems (i.e., excessive spans or impingement on boulders) are observed.
- Use of standard erosion control measures for access roads.

## 4.3 Meteorology and Air Quality

### 4.3.1 Meteorological Impacts

Potential environmental impacts related to meteorological conditions are associated with severe weather events. Potential impacts during construction include weather delays during pipelaying operations (onshore construction operations are relatively insensitive to weather conditions). This could require suspension of portions or all of the activities until the weather conditions improve.

Severe winds or extreme low temperatures could result in damage to the Osprey Platform, potentially resulting in a release of oil or other materials to marine surface water. The platform was designed to withstand winds of 80 mph (Table 2-1); wind speeds of this magnitude have a return frequency of about 100 years, as estimated for the Anchorage International Airport. Similarly, the platform is designed for a minimum ambient air temperature of –20ºF; the January mean minimum temperature at Kustatan (1999 to 2000) was 11.1ºF. Therefore it is unlikely that severe winds or low temperatures would damage the Osprey Platform under any of the alternatives considered in this EA.

### 4.3.2 Impacts on Air Quality

Impacts on air quality could occur during construction, normal operations, and under accident conditions.

#### 4.3.2.1 Impacts During Construction

Increased air emissions are expected during construction/installation of onshore and offshore project components. For the proposed project (Alternative 1), emissions will include air pollutants from fossil-fueled vehicles (increased truck traffic, operation of heavy equipment necessary for pipelaying operations, and offshore support vessels) and particulate matter (PM) from disturbance of the earth (grading, dozing, etc.). These emissions will be short-term (less than two months for onshore operations and less than five months for offshore operations) and minor.

#### 4.3.2.2 Impacts During Normal Operations

For the purposes of this analysis, the following criteria have been established to assess the possible magnitude of impacts:

- Negligible: less than 100 tpy of emissions of any regulated pollutant
- Minor: 100 to less than 250 tpy of emissions of any regulated pollutant
- Moderate: 250 tpy or more emissions of any regulated pollutant and no adverse decrease in visibility at Tuxedni Wilderness Area
- Major: 250 tpy or more emissions of any regulated pollutant and an adverse decrease in visibility at Tuxedni Wilderness Area

The break between minor and moderate is generally taken as the applicability threshold for a PSD permit (250 tpy of any regulated pollutant). Although the PSD permits carry the designation of a "major" source per EPA and ADEC air quality regulations, this assessment is made on the basis of possible impacts.

Air quality impacts from the proposed project would be due to pollutants, primarily $NO_x$ and CO, emitted during the combustion of fossil fuel to support drilling and production operations at the Osprey Platform and the Kustatan Production Facility. Emissions sources would include generators and boilers, for example. The proposed facilities are still being designed; however preliminary emission estimates have been prepared for the proposed project (HCG 2001a, b) and are presented in Table 4-4.

Based upon information provided in the Air Quality Construction Permit applications for the Osprey Platform and the Kustatan Production Facility (HCG 2001a, b), the Alaska State Implementation Plan (SIP)-approved PSD regulations, and EPA's PSD guidance documents, the Osprey Platform and Kustatan Production Facility are considered a single "facility" under the Alaska SIP-approved PSD regulations. Further clarification of this issue is provided in Appendix G.

Because the two sources are considered one facility under the PSD regulations, their combined emissions were compared to the PSD applicability threshold of 250 tpy. As shown in Table 4-4, the potential emissions of all criteria pollutants resulting from the combined activities of the onshore and offshore sources operating as defined in the proposed project are predicted to be below the 250 tpy PSD applicability threshold.

Forest Oil is proceeding with monitoring and evaluations assuming that ADEC construction air permits will be required but that a PSD permit will not be required.

Dispersion modeling in support of the ADEC construction air permit applications has been conducted. Based on a review of the dispersion modeling assumptions and results, ADEC has determined that Forest Oil has adequately demonstrated compliance with the $NO_2$ and CO National Ambient Air Quality Standards (NAAQS) (Appendix G).

Based on the above criteria and discussions, normal operating conditions for the proposed project are predicted to pose a minor impact on air quality.

4.3.2.3 Accidents

Potential impacts to air quality associated with accidents could result from an upset such as an explosion or large release of crude oil, which subsequently caught on fire. Such an event would be rare, however, and the probability of its occurrence is difficult to calculate. The air quality impacts from such an event would be short-term and temporary.

4.3.2.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Emissions resulting from construction under Alternative 2 are predicted to be roughly the same as those from the proposed project. The onshore pipeline would be much shorter (i.e., less than 1,000 feet), which would result in lower PM emissions than those expected under the proposed project. Emissions during normal operations for Alternative 2 would be the same as for the proposed project, as the same equipment would be operated both at the Osprey Platform and the Kustatan Production Facility under both scenarios. Under Alternative 2, potential emissions of all criteria pollutants are predicted to be below the 250 tpy PSD applicability threshold for the combined activities of the onshore and offshore facilities operating as defined in this alternative. Alternative 2 is predicted to pose a minor impact on air quality.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Emissions from Alternative 3 would be lower since there would be no construction of an offshore production facility. Emissions during normal operations would be the same or slightly lower than from the proposed project and Alternative 2. The majority of predicted air pollutant emissions are the result of producing the necessary power to pump and treat the crude oil, and are directly proportional to the throughput of crude to be handled and distance to be pumped. Ancillary sources at the onshore facility, such as for lighting, fire pumps, and comfort HVAC, are minor sources in comparison. Since the amount of crude to be handled remains the same under Alternative 3, it is reasonable to predict that the Trading Bay Production Facility would need to increase consumption of fossil fuels to handle the crude from the Osprey platform, and air pollutant emissions would be similar or less than those predicted for the proposed project (NCG 2001). Under Alternative 3, only the platform emissions would be considered in determining PSD applicability, and emissions of all regulated air pollutants fall below the established thresholds. Alternative 3 is predicted to pose a minor impact on air quality from the Osprey Platform, and a minor impact on air quality at Trading Bay.

***Alternative 4 (No Action).*** No construction or normal operations would take place, and therefore no air emissions would occur. This alternative would have no impacts on air quality.

4.3.2.5 Cumulative Impacts

The total emissions from the platform/onshore production facility represent a relatively small percentage of the total emissions for the general region (less than 2 percent of the total emissions within a 55 kilometer radius of the platform during the exploration phase; Hoefler 1999). Since ambient levels of regulated air pollutants in the project vicinity are well below the applicable NAAQS, the proposed project is not expected to contribute significantly to cumulative air quality impacts.

4.3.2.6 Mitigation Measures

Appropriate mitigation measures include:

- Development of an air monitoring program.
- Use of best available technology to minimize emissions from the platform and the onshore production facility.

## 4.4 Physical Oceanography

Potential environmental impacts associated with physical oceanography include: increased turbidity during pipeline placement; and pipeline damage related to currents, waves, and ice. Sections 4.4.1 through 4.4.3 describe potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are described in Section 4.4.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.4.5 and 4.4.6, respectively.

### 4.4.1 Impacts During Construction

Potential construction impacts related to physical oceanography include increased turbidity during pipeline placement. Strong currents in the vicinity of the platform will result in rapid dispersion of suspended sediments, however. Increased turbidity as a result of construction operations is discussed further in Section 4.5 (Marine Water Quality).

High winds, waves, ice presence, and possibly fog could delay construction operations and result in increased environmental disturbance. Construction activities will be conducted during the summer and fall when weather conditions are likely to be good and ice is not present in the upper inlet. Associated impacts on the marine environment due to project construction are expected to be short-term and minor.

### 4.4.2 Impacts During Normal Operations

No potential environmental impacts related to physical oceanography during normal operations have been identified. Potential pipeline damage due to current effects is discussed in the following section.

### 4.4.3 Accidents

Environmental impacts related to physical oceanography are associated primarily with the potential for pipeline damage and subsequent releases of crude oil and gas.

Oil and gas pipelines have been operating in upper Cook Inlet, both north and south of the proposed pipeline route, since the mid-1960s to early 1970s (Belmar 1993). A total of about 525 miles of pipeline were placed in about 270 miles of pipeline corridor mostly between 1965 and 1974 (one line was laid in 1986). Pipeline diameters range between 4 and 10 inches. Problems with these pipelines have primarily been associated with suspension of pipelines that lie in sand and gravel wave areas, and impingement of boulders on pipelines. The potential for damage from vessels dragging anchors across pipelines also exists.

Based on preliminary information, the proposed underwater pipeline may cross sand and gravel waves; however, the waves are likely to be of relatively low amplitude due to the water depths and proximity to shore. Based on experience with other pipelines in the area, there is a general concern when long sections of pipeline (typically 50 feet or more) become suspended between the sand and gravel waves (NCG 2001). The specific concern is that currents will tend to induce vibrations in the lines that could lead to fatigue failure in the line. From 1965 to 1983, there have been 15 reported pipeline failures in Cook Inlet. Two of these failures were associated with failure of the marine riser at the platform, and the others were associated with failures due to pipeline suspensions. One other failure occurred in 1987 in the Granite Point area, and was a result of abrasion from a suspended portion of the pipeline resting on a rock outcrop. Pipeline suspensions in existing routes are determined through side scan sonar surveys conducted every 1 to 2 years. Remediation efforts typically used to correct the problem include placement of sandbags in the more prominent sections of suspension (using diver support).

The periodic surveys also occasionally detect large boulders or debris resting on or next to a pipeline. As indicated above, at least one pipeline failure occurred as a result of pipeline abrasion occurring in conjunction with a suspension. In these cases, sandbags would also be used to stabilize the object and pipeline.

An occasional problem that can occur is the dragging of anchors across pipelines. Of particular concern are larger vessels (tankers, cargo ships, etc.) that travel through the area. Under normal circumstances, there would not be any reason for the larger vessels to drag their anchors in the area; pipeline corridors are marked on nautical charts for the area. Smaller vessels have been known to occasionally drag anchors across lines, but these seem to have little effect on the lines (NCG 2001).

Although ice forces on pipelines are normally less than those imposed by conditions as discussed above, ice is normally a consideration for pipelines in Cook Inlet. The primary concern would be abrasion or damage to coatings the pipeline may have to minimize corrosion. As a general practice, pipelines have been buried in the intertidal and shallow subtidal areas to prevent impingement of ice on the pipeline.

With proper design and maintenance, pipelines for the proposed project can be operated in Cook Inlet with minor impacts. The proposed pipeline routing avoids boulders and other features that could result in pipeline suspensions. Mitigation measures to minimize the potential for pipeline damage will be employed as described in Section 4.4.6. If a pipeline rupture did occur, up to 1,633 barrels (70,000 gallons) of crude oil could be released to the marine environment (NCG 2001). Environmental impacts related to pipeline rupture accidents are discussed in more detail in Section 4.5, Marine Water Quality.

### 4.4.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Potential impacts associated with construction activities would be comparable to the proposed project, with the exception that the underwater pipeline would be 3.3 miles, rather than 1.8 miles. Thus, a larger area of the seafloor would be disturbed (and increased turbidity generated) during pipeline placement operations. Construction impacts associated with

Alternative 2 are expected to be short-term and minor. The potential for pipeline damage and subsequent releases of crude oil to the marine environment are greater for Alternative 2 than for the proposed project. Side scan sonar surveys of the pipeline routing for Alternative 2 discovered the presence of a large boulder bed (NCG 2001) that would significantly impact placement of the pipeline along this route and increase the risks of pipeline damage. In addition, the underwater pipeline for this alternative is 80 percent longer than the proposed project.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Potential impacts associated with construction activities would be comparable to the proposed project, with the exception that the underwater pipeline would be 10.5 miles, rather than 1.8 miles. Thus, a larger area of the seafloor would be disturbed during pipeline placement. The potential for pipeline damage and subsequent releases of crude oil to the marine environment are greater for Alternative 3 than for the proposed project. The 10.5 mile pipeline is significantly longer than for the proposed project; no surveys have been performed along this route and therefore the risks are unknown.

***Alternative 4 (No Action).*** No seafloor would be disturbed or turbidity generated under this alternative. No pipelines would be constructed under this alternative; therefore there is no potential for pipeline damage.

### 4.4.5 Cumulative Impacts

Pipeline spills and leaks from the proposed project could contribute to cumulative impacts on the marine environment in central Cook Inlet. If a major pipeline rupture occurred, a maximum of 1,633 barrels of crude oil would be released. The probability of such a rupture is very low (see Section 4.1.4). Smaller leaks and spills are more likely but would not contribute significantly to cumulative impacts on the marine environment in the general vicinity of the project or in Cook Inlet.

### 4.4.6 Mitigation Measures

The following mitigation measures will be employed by Forest Oil to minimize the potential for pipeline damage (NCG 2001):

- Preplacement side-scan sonar and shallow sub-bottom geophysical surveys to avoid boulder or rocky areas to the extent possible.
- Shallow borings to determine whether the intertidal segment can be placed by boring (preferred) rather than by trenching.
- Use of current industry standards for pipelines/utilities in locations such as Cook Inlet.
- Burial of the pipeline in the intertidal and shallow subtidal areas.
- Use of periodic side scan sonar surveys (every 2 years) to inspect the integrity of the pipeline and conduct remedial actions (typically sandbagging) if potential problems (i.e., excessive spans or impingement on boulders) are observed.

## 4.5 Marine Water Quality

Impacts on marine water quality can occur as a result of sediment disturbance during construction activities, discharges from the Osprey Platform during normal operations, and from releases during accident conditions (e.g., oil spills). Sections 4.5.1 through 4.5.3 describe potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are described in Section 4.5.4.

Cumulative impacts and applicable mitigation measures are identified in Sections 4.5.5 and 4.5.6, respectively.

### 4.5.1 Impacts During Construction

Nearshore and offshore pipeline placement will cause disturbance of sediment and a resultant increase in turbidity. In particular, trenching through the intertidal/shallow subtidal area will result in increased suspended sediment concentrations. The magnitude of possible suspended sediment concentrations resulting from the nearshore pipeline trenching was estimated by assuming the following general conditions during the operation:

- the trench is constructed from a 150-foot barge using either a backhoe or clamshell with a production rate of approximately 10 cubic yards per minute;
- the water depth is 5 feet; and
- seabed materials contain 5 percent fines by volume that could be suspended during the plow operations (most materials are expected to be sand, gravel and cobble-sized materials).

Investigations by Dames & Moore (1978) and NORTEC (1981) suggest that in a situation such as this, the physical presence of a construction barge and operating equipment is sufficient to result in the formation of a turbulent wake downcurrent of the plow, and that suspended sediments can be estimated using principles of wake theory. In addition, concentrations would be reduced by downcurrent deposition, but have been ignored in this application in order to produce conservative estimates of impacts.

Calculations made by Forest Oil (NCG 2001) indicate that while the trench is being constructed, it will remove seafloor sediments at a rate of about 4.5 $ft^3$/sec (10 $yd^3$/min). Assuming 5 percent fines (suspendable materials) and assuming that all fines will become suspended, sediment discharge rates will be on the order of 0.23 $ft^3$/sec.

The dimensions of the turbulent wake are expected to remain constant at all current speeds (NORTEC 1981) and would have a general cone-like appearance that increases in height at an angle of about 10 to 15 degrees. Actual concentrations within the wake will be dependent on the actual ambient current speeds. Table 4-5 summarizes predicted downcurrent suspended sediment concentrations under a general range of currents anticipated in the general construction area.

As indicated in Table 4-5, increased suspended sediment concentrations at a downcurrent distance of 1,000 feet will be less than 50 mg/L at 1-knot currents (and less at higher currents). These effects are short-term and are anticipated to occur only during actual construction activities.

As inferred from the results of studies by Lees et al. (1999), sediments along all proposed pipeline routes are expected to be free of man-made contaminants, including hydrocarbons from petrogenic sources. As such, possible adverse effects from turbidity plumes would be associated only with physical effects from increased turbidity. Given the naturally high ambient turbidity, impacts of the proposed project are expected to be short-term and minor.

Placement of the underwater portion of the pipeline using either the pipe pulling or lay barge methods will result in increased turbidity near the seafloor due to dragging of cables, pipelines, and anchor placement. Associated impacts are expected to be short-term (up to one week) and minor.

Additional impacts on marine water quality during construction could occur as a result of minor oil spills. Minor spills (typically 50 barrels or less) could occur from barges and support vessels used during platform and pipeline construction/placement. Impacts on water quality related to oil spills are discussed in Section 4.5.3.

### 4.5.2 Impacts During Normal Operations

Discharges from the proposed project will include deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry. These waste streams are described in Section 2.2.1.8. Wastes will be discharged from the Osprey Platform in accordance with an NPDES permit for which an application has been submitted to EPA (Appendix A). Waste stream volumes and characteristics are presented in Table 4-6.

4.5.2.1 Sanitary Waste Discharges

One potential impact of the sanitary waste discharge is the possible reduction in ambient dissolved oxygen concentrations in the receiving waters when sanitary waste is discharged (Tetra Tech 1994). The dissolved oxygen standard for aquatic life is usually 6 mg/L (Jones and Stokes 1989), while the ambient dissolved oxygen in the receiving waters of Cook Inlet is assumed to be higher than 8 mg/L (EPA 1984). In an analysis of a worst case scenario, EPA (1984) concluded that the discharge of treated sewage effluent during offshore exploratory drilling should not significantly impact aquatic life when ambient dissolved oxygen concentrations are at least 1 mg/L above the dissolved oxygen standard for aquatic life of 6 mg/L. Because the sanitation device is an aerated system capable of providing a minimum of 2,100 cubic feet of air per pound of BOD, dissolved oxygen in the effluent is anticipated to meet this requirement when the system is properly operated in accordance with the operating manual (UIG 1998).

The effluent is anticipated to contain average concentrations of total suspended solids (TSS) of less than 50 mg/L (Amundsen 2000b). This concentration is less than the daily maximum concentrations permitted for sanitary discharges from the oil and gas production platforms in Cook Inlet that operate under the NPDES General Permit (EPA 1999). Operated properly, TSS of the Osprey Platform sanitary discharge will be less than the ambient TSS in Cook Inlet of 100 mg/L (Brandsma 1999).

The wastewater will be chlorinated to remove fecal coliform (FC) bacteria. Effluent from the clarifier will flow through a chlorinator and into a 65-gallon chlorine detention tank where chlorine will dissipate for 30 minutes to an hour. Operated in accordance with the operating manual, the chlorine will reduce the fecal coliform bacteria to levels at or below the Alaska Water Quality Standard of 14 FC/100 ml.

The NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999) requires a total residual chlorine concentration of at least 1 mg/L to ensure proper disinfection of the sanitary waste without causing harm to the aquatic life. In the case of the Osprey Platform sanitary waste, it appears that sodium sulfite will be used to dechlorinate the effluent in-line immediately prior to discharge (UIG 1998). The sodium sulfite reacts with free and residual chlorine instantaneously, consuming a small amount of alkalinity (1.38 mg of $CaCO_3$/ml chlorine consumed) (UIG 1998). The concentration of total residual chlorine in the final effluent is anticipated to be less than or equal to 2 ug/L (Amundsen 2000b). Thus the water quality standards for residual chlorine will be met at the end-of-pipe, causing no direct or indirect impacts on aquatic life.

In addition to meeting water quality standards or anticipated NPDES effluent limits, the sanitary wastewater from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions, and three orders of magnitude under more turbulent conditions. It is expected that pollutants in the sanitary waste will be dissipated to undetectable concentrations within a few feet of the discharge.

4.5.2.2 Other Waste Streams

Oil is the primary pollutant found in deck drainage, with concentrations estimated at 24 to 450 mg/L (EPA 1996). Other potential contaminants include detergents and spilled drilling fluids. Contaminated deck drainage will be treated through an oil-water separator prior to discharge and will be required to meet state water quality standards. Therefore, no adverse impacts on water quality are anticipated to result from discharge of deck drainage.

Domestic waste, which may contain kitchen solids and trace amounts of detergents, cleansers, and oil and gas, does not represent a significant discharge flow. Potential effects of domestic waste discharges are difficult to determine given the absence of analytical data, but are expected to be minimal.

Non-contact cooling water is not significantly different in composition than ambient seawater, except for an elevated temperature (estimated at 62° to 84°F; EPA 1996). Forest Oil's permit application indicates that non-contact cooling water will be discharged at an average temperature of less than 60°F, with a maximum daily value of 70°F, and therefore no environmental impacts are anticipated.

Boiler blowdown and fire control system test water are intermittent discharges that will be treated through an oil-water separator to remove oil and grease. No adverse impacts on water quality are anticipated due to these discharges.

Excess cement slurry represents another intermittent discharge. This waste stream may contain up to 200,000 mg/L of total suspended solids (daily maximum). The pH may be as high as 12, with temperatures up to 80°F and oil and grease up to 50 ppm (Amundsen 2000a). Although the exact composition of the cement is not documented, given the small waste volume and intermittent nature of the discharge, it is not expected to represent a significant pollution source and is not likely to result in adverse impacts.

Based on the above discussions, impacts on water quality of discharges from the proposed project during normal operations are considered to be negligible to minor. Potential impacts on marine biota and threatened and endangered species are discussed in Section 4.7 and 4.8, respectively.

### 4.5.3 Accidents

The largest potential environmental consequences resulting from an accident are associated with oil spills. Potential sources, volumes, and likelihood of oil spills are described in Section 4.1.4. Offshore oil spills could range in size from a small pipeline or diesel fuel spill, to 50,000 barrels or more from a well blowout (NCG 2001). Based on industry averages, spills of greater than 50 barrels are not expected to occur during the life of the proposed project. An average of approximately 12 smaller spills (i.e., less than 50 barrels) would be anticipated to occur (assuming a total production of 50 million barrels and a 30-year project life).

Oil spilled on the water would be subject to both weathering and advection. The spill would spread horizontally in an elongated pattern oriented in the direction of wind and currents and non-uniformly into thin sheens (0.5 to 10 μm) and thick patches (0.1 to 10 mm) (MMS 1996b). In cooler waters such as Cook Inlet, oil spills spread less and remain thicker than in temperate waters due to differences in oil viscosity. The presence of broken ice would also tend to retard spreading.

Evaporation results in the preferential loss of lighter, more volatile hydrocarbons, increasing their density and viscosity. Evaporation of volatile components can account for 30 to 50 percent of crude oil spill loss, with approximately 25 percent occurring in the first 24 hours (MMS 1996b). The initial evaporation rate increases with increasing winds, temperatures, and sea conditions. Evaporative processes occur on spills even in ice-covered waters, although at a slower rate. Diesel fuel evaporates more slowly than crude oil, with approximately 10 to 15 percent evaporating within 40 hours (at 23°C). However, a larger percentage overall of diesel fuel will eventually evaporate (MMS 1996b).

Dispersion results in the loss of soluble, low-molecular-weight (LMW) aromatics such as benzene, toluene, and xylenes. The LMW aromatics, which are acutely toxic, rapidly dissolve into the water column; however, dissolution is very slow compared to evaporation and most volatiles usually evaporate rather than dissolve. Dissolved hydrocarbon concentrations beneath an oil spill therefore tend to remain less than 1 part per million (MMS 1996b).

Emulsification results from incorporating water droplets in the oil phase and generally is referred to as mousse. Mousse formation is promoted by water turbulence such as induced by wave action. Mousse formation increases the viscosity, specific gravity, spreading characteristics, and slows the subsequent weathering process (MMS 1996b).

Oil spills are additionally affected by the presence of high suspended sediment concentrations such as occur in the upper inlet. It is believed that oil adheres to sediment particles, thereby increasing its density and eventually sinking. In a number of spills in the upper inlet, surface slicks have not been observed after several days.

In addition to the changes in physical characteristics as outlined above, offshore spills from the proposed operation can be rapidly transported by winds and currents. Strong tidal currents alone can transport oil 20 to 25 miles in a single tidal excursion. According to modeling performed by Forest Oil (NCG 2001), after one day, a platform spill could be located anywhere between the North Forelands to the north and the southern tip of Kalgin Island to the south. After 3 days, the spill could be located nearly anywhere within Cook Inlet. At the end of 15 days, most remaining oil would be on the beach with some possibly remaining in tidal rips in the lower inlet. Areas most heavily impacted from a major platform spill would be the west side of the inlet between Harriet Point at the south end of Redoubt Bay (including Kalgin Island) northward to the vicinity of the North Forelands. On the east side, most likely impacted areas would be from the East Foreland southward to the general Ninilchik area.

As discussed in Section 4.1.4, industry data indicate that there is some potential for oil spills associated with the proposed project. If a major oil spill were to occur, potential environmental impacts could be significant. However, the probability that a major spill will occur is low and impacts on water quality would be short-term (e.g., less than 3 years). In addition, mitigation measures described in Section 4.5.6 would help reduce the potential impacts on water quality. Smaller spills, which are more likely to occur during the life of the project, could result in minor to moderate impacts on water quality. Specific impacts from oil spills are further discussed for individual impact areas in the remainder of Section 4.0.

### 4.5.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Impacts due to construction and normal operations would be similar to the proposed project, since discharges from the Osprey Platform are the same in both cases. This alternative would have a slightly higher probability of an oil spill due to an underwater pipeline rupture/leak, because of the increased length of the pipeline. Based on extrapolations performed by Forest Oil (NCG 2001), under this alternative, the probability of a major pipeline rupture would be about twice that of the proposed project.

Overall, impacts from Alternative 2 are expected to be minor to moderate for construction and normal operations. If a major oil spill were to occur, potential environmental impacts could be significant. However, the probability that a major spill will occur is low and impacts on water quality would be short-term. In addition, mitigation measures described in Section 4.5.6 would help reduce the potential impacts on water quality. Smaller spills, which are more likely to occur during the life of the project, could result in minor to moderate impacts on water quality.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Impacts due to construction and normal operations would be similar to the proposed project, since discharges from the Osprey Platform are the same in both cases. This alternative would have a slightly higher probability of an oil spill due to an underwater pipeline rupture/leak, because of the increased length of the pipeline. Based on extrapolations performed by Forest Oil (NCG 2001), under this alternative, the probability of a pipeline rupture would be about six times greater than for the proposed project. Overall, impacts from Alternative 3 are expected to be minor to moderate for construction and normal operations. If a major oil spill were to occur, potential environmental impacts could be significant. However, the probability that a major spill will occur is low and impacts on water quality would be short-term. In addition, mitigation measures described in Section 4.5.6 would help reduce the potential impacts on water quality. Smaller spills, which are more likely to occur during the life of the project, could result in minor to moderate impacts on water quality

***Alternative 4 (No Action).*** No impacts on water quality would be anticipated under the no action alternative.

### 4.5.5 Cumulative Impacts

Other discharges of similar quality in Cook Inlet include: sanitary, domestic, deck drainage, and other waste discharges from oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are expected to be minimal. All contaminants of concern will be discharged at concentrations that meet water quality criteria and the requirements of the General Permit (EPA 1999). In addition, the strong tidal fluxes associated with Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, there would be no cumulative impacts on water quality from the discharges associated the Osprey Platform.

The discharges will meet human health water quality criteria at the end-of-pipe. These criteria are designed to protect humans from accumulation of harmful contaminant concentrations based on consumption of fish and shellfish. The discharges will also meet the water quality criteria at the end-of-pipe for protection of aquatic life. Monitoring is anticipated to be required by the NPDES permit that will be issued for the Osprey Platform to ensure compliance with the water quality standards. No water quality-based limits are needed to provide protection to aquatic life.

Wastewater from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions and three orders of magnitude under more turbulent conditions. Therefore, the minimal concentrations of TSS and BOD that will be discharged from the sanitary wastewater stream at the Osprey Platform are anticipated to be rapidly dissipated and have no potential cumulative impacts on water quality.

Cumulative impacts on water quality related to oil spills are believed to be minor. The proposed project would include operation of one additional offshore production platform and placement of about 7 additional miles of pipeline (3 pipelines) offshore. Currently there are 15 platforms and over 500 miles of offshore pipelines in operation in the upper Cook Inlet. Recent investigations on effects of Cook Inlet oil and gas operations indicate only a few (and extremely local) cumulative impacts on sediment and water quality from industry operations in the inlet (see also Section 4.1.4). Within the context of existing regional conditions, these would be neither unusual nor add significantly to potential cumulative effects from oil and gas operations in Cook Inlet.

### 4.5.6 Mitigation Measures

The following actions have been identified to minimize the potential for an oil spill and to mitigate potential impacts on water quality if a spill were to occur (NCG 2001):

- Monitoring to ensure compliance with water quality standards.
- Installation of overfill protection and secondary containment to mitigate potential diesel tank ruptures.
- Use of blowout preventers and monitoring of drilling mud weight to minimize the potential for a well blowout.
- Installation of a SCADA monitoring and control system.
- Internal and external monitoring of pipelines.
- Preparation and adherence to an ADEC-approved Oil Discharge Prevention and Contingency Plan (C-Plan). This plan will be formatted in accordance with ADEC regulations (18 AAC 75) and describes specific methods to prevent, detect, and respond to spills in the event they occur. The C-Plan will be prepared and approved prior to initiation of production operations.
- Preparation and adherence to Facility Response Plans (FRPs) for the Minerals Management Service (per 30 CFR 250 and 254), the Research and Special Programs Administration (per 49 CFR 194), and the U.S. Coast Guard (per 33 CFR 154) as required by the Oil Pollution Act of 1990. The FRPs will be incorporated into the ADEC C-Plan with appropriate cross-references.
- Preparation of a Spill Prevention Control and Countermeasure (SPCC) Plan as required by EPA (per 40 CFR 112) for both the Osprey Platform and the Kustatan Production Facility. The SPCC will also be incorporated into the ADEC C-Plan.
- Maintain membership in the Cook Inlet Spill Prevention and Response, Inc. (CISPRI), a federally-approved Oil Spill Removal Organization (OSRO). CISPRI currently maintains a response capability to handle in excess of a 50,000-barrel spill in Cook Inlet waters.

## 4.6 FRESHWATER RESOURCES

Potential environmental impacts on freshwater resources include erosion and sedimentation during construction, water supply requirements during production operations, and effects of oil spills on freshwater resources. Sections 4.6.1 through 4.6.3 describe potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are described in Section 4.6.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.6.5 and 4.6.6, respectively.

### 4.6.1 Impacts During Construction

Impacts on freshwater resources could occur during construction of the onshore production facility and the onshore pipelines/access road. Erosion and increased sedimentation may result from the use of large earth-moving equipment such as backhoes and bulldozers along the 1.8-mile corridor between the tip of the West Foreland and the Kustatan Production Facility and during the construction of the production facility itself. The facility is subject to the conditions of the NPDES General Permit for Storm Water Discharges from Construction Activities (63 FR 7858), and therefore Forest Oil must prepare a Storm Water Pollution Prevention Plan (SWPPP) to address potential construction impacts. Mitigation measures are discussed in Section 4.6.6.

The proposed onshore pipeline and access road will not cross any streams, but will pass through 772 lineal feet of wetlands. Use of sediment barriers in the vicinity of wetlands and other construction best practices (such as limited disturbance of the surficial organic soils and avoiding steep cuts) should be used to minimize erosion and sedimentation. Impacts on wetlands are discussed further in Section 4.9.

Construction impacts are anticipated to be short-term and minor.

### 4.6.2 Impacts During Normal Operations

The proposed Kustatan Production Facility will initially require up to 19,000 bbl of water per day to support water injection operations. The proposed source of water will be deep groundwater sources (from depths of about 12,000 feet) from the unsuccessful Tomcat Exploration Well. This well is located at the currently proposed location for the onshore production facility (e.g. the former Tomcat Exploration Well Site). This proposed water source is not considered to be potable water (due to high chloride concentrations) and is not hydrologically connected to the shallow potable water sources used for water supplies in the area (NCG 2001).

The closest known water well is located at the West McArthur River Unit (operated by Forest Oil), which is approximately 4.5 miles north of the proposed onshore production facility. There are no other known groundwater users within 5 miles of the proposed Kustatan site and no conflicts for water use are anticipated. Appropriate water rights and approvals must be obtained from the ADNR and the AOGCC for the water use.

Storm water runoff from the facility may result in the transport of pollutants to surface water. Potential mitigation measures are discussed in Section 4.6.6.

Overall, potential impacts on fresh water resources due to normal operations are expected to be minor for the proposed project.

### 4.6.3 Accidents

Spills from the onshore production facility (oil, produced water, or diesel fuel) or onshore pipelines could potentially impact surface water and ultimately shallow groundwater sources that may be used by the few local residents in the area. Private users in the immediate area may use water resources but they do not have water rights from the Alaska Department of Natural Resources (with the exception of Forest Oil) and as such little is known of specific sources and quantities used. It is expected that any water use is seasonal in nature. Potential impacts on shallow groundwater resources from a spill are expected to be minor.

Oil spills could also impact wetlands and the plants and animals that utilize wetland habitat. These impacts are discussed in Section 4.9.

### 4.6.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Potential impacts on freshwater resources would be comparable and slightly lower than for the proposed project. A much shorter onshore pipeline (i.e., less than 1,000 feet) would be constructed, and therefore erosion and sedimentation would occur primarily during construction of the Kustatan Production Facility. Water supply requirements would be the same as for the proposed project. Spills are less likely to occur under Alternative 2 because the 1.8-mile pipeline from the tip of the West Foreland would not be constructed; therefore, only spills from the onshore production facility and the short onshore pipeline could occur.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Under this alternative, the Kustatan Production Facility and pipelines/access road would not be constructed. Water resources would be required from the vicinity of the Trading Bay Production Facility, and potential use conflicts could occur at this location (NCG 2001). Potential oil spill impacts would occur in the vicinity of Trading Bay, rather than the West Foreland area. Information on potential oil spill impacts on freshwater resources near Trading Bay was not available.

***Alternative 4 (No Action).*** No construction or production operations would be conducted under Alternative 4, and therefore no impacts on freshwater resources would occur.

### 4.6.5 Cumulative Impacts

No cumulative impacts on freshwater resources are anticipated to occur due to the proposed project. Construction impacts would be localized and short-term. Although large quantities of groundwater will be required during production operations, no resource conflicts are known. Cumulative oil spill impacts are discussed in Section 4.9.

### 4.6.6 Mitigation Measures

Applicable mitigation measures include the following:

- Preparation and adherence to a Storm Water Pollution Prevention Plan (SWPPP) to mitigate impacts of erosion, sedimentation, and storm water runoff on freshwater resources.
- Use of best management practices (BMPs) to retain sediment on site to the extent practicable, including, as appropriate: (1) stabilization practices (e.g., establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of mature vegetation) and (2) structural practices (e.g., silt fences, earth dikes,

drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, reinforced soil retaining systems, temporary or permanent sediment basins).

- Use of BMPs to control pollutants in storm water discharges that will occur after construction operations have been completed, including, as appropriate: storm water detention structures, flow attenuation by use of open vegetated swales and natural depressions, and infiltration of runoff onsite.
- Use of sediment barriers and other construction techniques (e.g., limited disturbance of surficial organic soils and avoidance of steep cuts) in the vicinity of wetlands to minimize erosion and sedimentation.

## 4.7 Marine Biological Resources

Potential environmental impacts on marine resources are reviewed in this EA primarily at the population level, although impacts to individuals are also considered. Management is generally conducted at the population level, and although individuals may be affected by project activities, population-level effects should guide evaluation processes. Scientists typically study individual behavior, physiology, and health and extrapolate those findings to the population level to evaluate impact. The findings and their interpretation by resource managers are the key to appropriate evaluation of the impacts of any project. It is important to remember that population level effects are likely not as obvious as those observed in individuals, and there may be a time lag in a population's response to human activities. In addition, population responses may be masked due to natural variability in measurements and cumulative effects of actions over space and time.

Potential impacts on marine biological resources from the proposed project may occur as a result of construction activities (e.g., habitat disturbance and alteration, noise), normal operations (e.g., discharges from the Osprey Platform), and accidents (e.g., oil spills). Sections 4.7.1 through 4.7.3 describe the potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are described in Section 4.7.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.7.5 and 4.7.6, respectively.

### 4.7.1 Impacts During Construction

Environmental impacts on marine biological resources during construction may occur as a result of benthic habitat disturbance and noise impacts of construction activities.

#### 4.7.1.1 Lower Trophic Level Organisms

Potential construction impacts are associated with the seafloor disturbance and increased turbidity from pipe laying operations for the underwater pipeline. Because of the highly energetic nature of the seafloor sediments, impacts are likely to be short-term in nature. Benthic communities in the upper inlet are generally sparse and naturally subjected to continual seabed movements. Assuming a disturbed seafloor area approximately 50 feet wide, a total of 11 acres of seafloor could be disturbed by the proposed project (a 1.8 mile long pipeline/utility corridor). Associated impacts are expected to be minor and short-term.

#### 4.7.1.2 Fish

Because of naturally high suspended sediment concentrations and general lack of year-round food sources (Tarbox 1999; NCG 2001), the upper inlet has a relatively limited resident fish population. The Kustatan River and many of the other anadromous fish-bearing streams in upper Cook Inlet have significant numbers of outmigrating salmon smolts and returning adult salmon nearshore. Eulachon also return to spawn in some of the rivers. Consequently, construction activities during this period could pose a significant threat to seasonal fish concentrations. If construction activities are timed to avoid impacts to migating fish, relatively low resident fish populations and the short-term nature of construction make significant impacts on fish unlikely.

4.7.1.3 Marine Birds

Human activities associated with construction of the Osprey Platform and Kustatan Production Facility, particularly air traffic near nesting waterfowl and seabirds, could reduce the productivity of local bird populations and may cause temporary abandonment of important nesting, feeding, and staging areas (MMS 1995). The responses of birds to human disturbance are highly variable. These responses depend on the species; the physiological or reproductive state of the birds; distance from the disturbance; type, intensity, and duration of the disturbance; and many other factors. The movement and noise of low-flying aircraft passing near seabird colonies often frightens most or all adult birds off their nests, leaving the eggs and young vulnerable to exposure, predation, and accidental displacement from the nest. Aircraft disturbance of waterfowl has been shown to cause lower nesting success of Pacific brant and common eider. Repeated air traffic disturbance of concentrations of feeding and molting waterfowl and shorebirds on coastal lagoons and other wetlands may reduce the ability of migratory birds to acquire the energy necessary for successful migration. Major known concentrations of marine birds are located at the Redoubt Bay Critical Habitat Area and the Trading Bay State Game Refuge. If construction activities are conducted during nesting periods, impacts on marine birds could be minor to moderate.

4.7.1.4 Marine Mammals

***Baleen Whales.*** Construction activities during the summer months could result in increased aircraft and vessel traffic in Cook Inlet when a small number of cetaceans may be present in the inlet. Impacts will most likely result from noise produced by vessel and aircraft traffic and construction activities, and it is likely that activities will affect all of these species similarly. The levels, frequencies, and types of noise that will elicit a response vary between and within species, individuals, locations, and seasons. Behavioral changes may be subtle alterations in surface-respiration-dive cycles, more conspicuous responses such as changes in activity or aerial displays, movement away from the sound source, or complete avoidance of the area (Richardson et al. 1995). Due to low density and wide distribution of these species, construction is expected to have negligible to minor impacts on these whale populations.

***Harbor Porpoise and Dall's Porpoise.*** Activities related to construction could potentially affect harbor and Dall's porpoises in Cook Inlet. Dall's porpoises dove, moved erratically, or rolled to look upward at an overflying Bell 205 helicopter at 215 to 365 m altitude (Withrow et al. 1985). Noise from construction activities is expected to cause only temporary, localized behavioral reactions to porpoises in Cook Inlet.

***Killer Whale.*** There are no systematic studies examining the effects of noise on killer whales. However, there have been reports of short-term behavioral reactions to aircraft in toothed whales, such as turning away, abruptly diving, and looking towards the aircraft (Malme et al. 1989). Increased vessel traffic associated with construction should not cause any long-term impact on killer whales. Potential behavioral responses could include altering swimming speed and moving away from the noise source. Although construction and vessel activity may temporarily disturb killer whales, impacts are expected to be short-term and negligible.

***Harbor Seal.*** Johnson et al. (1989) reported that harbor seals respond to human disturbance and noise in a variety of ways. At times, this species cannot be made to disperse from an occupied area even when severe forms of disturbance are employed, while at other times human disturbance has caused entire haul-outs to be abandoned, causing pups to be separated from their mothers. Low-flying aircraft has been responsible for mass stampedes exiting haul-outs and pupping beaches (Johnson 1977; Pitcher and Calkins 1979). Johnson (1977) estimated that low-flying aircraft may have been responsible for more than 10 percent mortality of the 2,000 pups born on Tugidak Island, Alaska in 1976. Once separated, a pup is likely to die if not reunited with its mother. Pup survival may be reduced if the pup is relocated. Because construction activities are short-term and localized, and since no harbor seal haulout areas have been identified in the immediate project vicinity, construction impacts on harbor seals are expected to be short-term and minor.

***Sea Otter***. Noise and disturbance from construction activities and increased vessel and aircraft traffic associated with construction activities could cause sea otters to abandon or avoid otherwise suitable habitat (USFWS 1993). However, Riedman (1983) subjected sea otters in California to simulated industrial noises associated with oil and gas exploration and development and found no movements of otters out of the vicinity of the sound projection, indicating no habitat abandonment. One group of otters displayed slightly alarmed behavior at the close approach of a seismic air gun vessel and the loud airborne sounds generated. Mating activities and mother-pup interactions were considered unaffected during all phases of the air gun experiments. Riedman (1983) concluded that the behavior, density, and distribution of sea otters in the study area was not affected by the playback of industrial noises and the sounds generated by the air guns. Sea otters appear to habituate to regular human activity, as they may be commonly viewed swimming leisurely about the docks of Valdez or from fast-moving commercial glacier/wildlife viewing boats in Prince William Sound and the Gulf of Alaska. Noise associated with construction will most likely have negligible impacts on the Cook Inlet sea otter population.

### 4.7.2 Impacts During Normal Operations

Potential impacts on marine biological resources during normal operations result primarily from Osprey Platform discharges, including sanitary waste, deck drainage, domestic waste, non-contact cooling water, excess cement slurry, fire control system test water, and boiler blowdown. The discharges are described in Section 2.2.1; impacts on water quality are discussed in Section 4.5.

#### 4.7.2.1 Lower Trophic Level Organisms

Low concentrations of BOD and nutrients in the sanitary waste discharge could stimulate primary productivity and enhance zooplankton production. This effect is anticipated to be negligible.

#### 4.7.2.2 Fish

No adverse impacts on fish are expected due to the waste stream discharges from the Osprey Platform. Total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. Discharges will be diluted by the strong tidal flux of Cook Inlet. All of the wastewater discharges will comply with water quality standards for the state of Alaska (18 AAC.70). Therefore, impacts on fish from normal operations are not expected to occur. Potential impacts on fish and essential fish habitat are discussed in more detail in the Essential Fish Habitat Assessment prepared for the Osprey Platform (Appendix C).

4.7.2.3 Marine Birds

No adverse impacts on marine birds are expected due to the waste stream discharges from the Osprey Platform. Minor noise impacts generated during production operations could result in negligible to minor impacts on nesting birds in the Redoubt Bay Critical Habitat Area.

4.7.2.4 Marine Mammals

Discharges will be diluted by the strong tidal flux of Cook Inlet. Low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production, but these effects will probably be negligible. Total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. All of the wastewater discharges will comply with water quality standards for the state of Alaska (18 AAC.70). Therefore, impacts on marine mammals from wastewater discharges are not expected to occur.

**4.7.3 Accidents**

The following sections consider the impacts to marine species of a major oil spill from either a well blowout at the Osprey Platform or an underwater pipeline rupture. A well blowout could release 5,500 barrels per day of crude oil; a pipeline rupture could release 1,633 barrels of crude oil. A spill of this magnitude could potentially occur but is not likely to occur during the life of the project (see Section 4.1.4).

4.7.3.1 Lower Trophic-Level Organisms

An oil spill associated with the proposed project could affect plankton and benthic communities. The effects of hydrocarbons on phytoplankton and zooplankton depend on the concentration and type of contaminant, and vary widely (NRC 1985). Studies have shown hydrocarbons to inhibit phytoplankton growth or cause mortality at higher concentrations (1 to 10 ppm), yet enhance growth at concentrations ≤0.1ppm (NRC 1985). Hydrocarbon concentrations of approximately 0.05 to 10 ppm are lethal to zooplankton (NRC 1985). Sublethal effects on zooplankton include reduced feeding and reproductive activity, and altered metabolic rates. Exposure time, toxicity, species, and life stage are all factors that influence the severity of impacts (MMS 1996a). Plankton communities exposed to oil spills and chronically polluted waters experienced short-lived effects in the field (MMS 1996a).

The effect of oil spills on benthic organisms depends on the type and amount of oil which they are exposed to (MMS 1996a). In most instances, oil spills float and most oil does not sink to the bottom. Therefore, it is unlikely that benthic communities would be heavily oiled from a blowout. Sublethal impacts associated with low concentrations of oil in the water column would be expected in the immediate vicinity of a spill. Sublethal effects to plants include reduced growth and decreased photosynthesis and reproductive activity; sublethal effects to marine invertebrates include injuries to physiological, reproductive, and growth processes (MMS 1996a). The greatest impact would be to immobile benthic organisms.

A spill that spreads to coastal areas by wind and current action could become concentrated in estuarine and coastal habitats and contaminate them. Contamination of these benthic habitats would result in the loss of biological productivity and diversity of oil-sensitive invertebrate communities. The effects could be long term in areas where oil is retained in sediments and persist for years. Thomas (1976) found that bivalve community numbers continued to decline for six years after initial oil exposure. Community recovery could take up to seven years (MMS 1996a). The negative impacts of oil contamination on benthic invertebrates may indirectly impact higher trophic-level species such as fishes and birds, especially shorebirds that feed on benthic invertebrates.

Depending on the size and location of the oil spill, negative impacts to lower trophic-level organisms could be negligible to moderate, with potential long-term impacts.

4.7.3.2 Fish

Fish mortality associated with the proposed project could be a direct consequence of exposure to a concentrated oil spill. Oil spills can have lethal effects on fishes (Howarth 1991), depending on spill size, oil type, season, weather conditions, and species contacting oil (Rice et al. 1984; MMS 1996a).

Location and timing of an oil spill would determine any adverse effect to Pacific salmon in Cook Inlet. Because of the limited area affected by even large oil spills relative to the pelagic distribution and highly mobile migratory patterns of salmonids, most impacts would be limited to a small fraction of the populations. The weathering and dispersal of the spilled oil would limit the length of time that the area would be affected. Pacific salmon are also able to detect and avoid oil spills in marine waters (Weber 1981; Dames and Moore 1990), which would reduce contact. Salmon aggregates in marine waters consist of mixed stocks, so even in the unlikely event of contact with an oil spill, a small fraction of any unique spawning population would be adversely affected.

Petroleum hydrocarbons can have numerous sublethal effects on fishes, and are known to alter behavior (e.g., feeding, predator avoidance), physiology (e.g., respiration, growth), physical development, pathogen resistance, and organ structure (Rice et al. 1984; Howarth 1991; MMS 1996b). Fish can incur sublethal effects well below the acute lethal dosages (Moles et al. 1981; Urho 1990). Oil exposure is known to slow growth of demersal fishes (flounder; Howarth 1991) and pelagic fishes (salmon fry and alevins; Moles et al. 1981; Wertheimer and Celewycz 1996; Willette 1996). Oil exposure reduces growth when fish shunt energy from growth to hydrocarbon metabolism and excretion (Rice et al. 1984; Willette 1996). Reduced growth can impair fish feeding rate, predator avoidance, and migration to suitable habitat and can therefore make survival in natural environments unlikely (Rice et al. 1984; Howarth 1991).

Additional sublethal effects of oil spills have been documented for salmon. Petroleum hydrocarbons may reduce the homing ability of salmon by damaging olfactory tissues (Babcock 1985 ). Oil exposure is known to slow growth of salmon fry and alevins (Moles et al. 1981; Wertheimer and Celewycz 1996; Willette 1996). Sublethal consequences to anadromous fish populations from an oil spill associated with the proposed project are moderate and long-term.

Fish that inhabit surface waters are more susceptible to oil exposure (MMS 1996a), but intertidal species can be trapped by oil driven ashore (Rice et al. 1984).

The effects of oil exposure to fish ranges from negligible to high, depending on the size, location, and timing of a spill. Mortalities and sublethal effects to fish populations could directly cause moderate, long-term consequences.

4.7.3.3 Marine Birds

Oil spills present the greatest potential threat to negatively impact marine bird species in Cook Inlet. A large oil spill in an area of high bird concentrations could affect thousands of birds, causing high mortality. Spill effects on marine birds have been well documented (MMS 1996b; Wells et al. 1995). Oil that contacts feathers directly can cause birds to die from hypothermia or drowning; oil ingested by preening birds may be toxic. Oil may also contaminate waterfowl and shorebird food sources such as benthic invertebrates and plant materials. For nesting birds, eggs may become contaminated from oiled feathers of incubating adults and produce toxic effects on chick embryos. Impacts on bird populations would be moderate to major depending on the timing, location of the oil spill, and number of birds that contact oil.

In addition, oil from a spill may be transported by wind and currents and could affect birds in other areas, either directly impacting them or contaminating food sources over a large area. Shallow nearshore benthic habitats used by diving ducks for feeding could be negatively impacted, as could intertidal feeding habitats used by shorebirds. Large areas of open water used by surface feeding species could also be contaminated. Currents in the lower Cook Inlet could move an oil spill into the Shelikof Strait, which is a high use area for marine birds and waterfowl (Forsell and Gould 1981), and negative impacts could be significant.

The effects of contamination of prey organisms or other food sources can be long-term and result in reduction of reproductive capabilities of predator species (Patten 1993). MMS (1996b) estimated that it would take at least three generations (approximately 15 years) for bird species to fully recover from a 50,000-barrel oil spill. Recovery times for predator species can be lengthy and last for a number of years. The extent of the impacts could be moderate to major depending on a number of factors including size of the oil spill, effects of wind and currents, quality and quantity of affected habitat, and number of birds using the affected area.

An oil spill in Cook Inlet can negatively impact birds at any time of the year (DeGange and Sanger 1986). Seasonal shifts in bird populations are largely the result of migration. Large concentrations of birds occur during spring migration when large numbers of waterfowl and shorebirds pass through the area. Waterfowl and shorebird numbers decline during the summer as these birds continue migrating north. At this time, numbers of breeding gulls, cormorants, and alcids increase as do numbers of seabirds such as fulmars and storm petrels. In the fall, bird densities drop as gulls and sea ducks depart and alcids move to pelagic waters, although dabbling duck and goose densities increase. Winter population densities are lower than other times of the year, as most gulls and migrating waterfowl have departed; sea ducks and seabirds are the most common groups during the winter.

Noise and disturbance associated with intensive oil spill cleanup activities may also contribute to the displacement and reproductive failure of many species of nesting birds.

Potential impacts on nonendangered bird species due to accidental spills in Cook Inlet under the proposed project could be minor to major and long-term, depending on size, location, and timing of a spill.

#### 4.7.3.4 Marine Mammals

**Nonendangered Baleen Whales (Minke and Gray Whales).** Oil spills could affect minke and gray whales occupying Cook Inlet waters through inhalation of hydrocarbon vapors, a loss of prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a reduction in feeding efficiency, and skin and/or sensory-organ damage. Based on observations from the Exxon Valdez oil spill, MMS (1996b) estimated that there would be minimal effect on minke and gray whales from a 50,000-barrel oil spill. An oil spill could have a larger impact during the summer, when whales may be present in Cook Inlet. However, because they are only infrequent visitors to Cook Inlet, and only individual minke and gray whales likely make limited excursions into the upper Cook Inlet, the magnitude of effect on the population as a whole should be negligible.

For both whale species, the number of whales affected by an oil spill would depend on the time of year and duration of the spill, the quantity of the spill, and an individual whale's ability to avoid the spill. The movement of oil into lower Cook Inlet or Shelikof Strait may affect a larger number of individuals. For example, gray whales migrate close to shore in southcentral Alaska and oil spills in Cook Inlet could affect feeding during migration.

Increased noise and disturbance from oil spill response and cleanup activities would have similar impacts as construction, due primarily to increased vessel and aircraft traffic. Potential impacts on minke and gray whales due to oil spills from the Osprey Platform or pipeline are expected to be negligible to minor.

**Killer Whale.** Accidental oil spills are most dangerous to killer whales through ingestion of contaminated prey (Geraci 1990; Würsig 1990). Bioaccumulation of toxins could lead to fatalities; however, if fatalities occur, they are expected to be few and have a negligible effect at the population level. Killer whale pods actively used oil-contaminated areas the year following the *Exxon Valdez* oil spill (Matkin et al. 1994). Because killer whales do not appear to avoid oiled areas, their risk of contamination is high. In addition, a higher mortality rate was observed in resident killer whales in Prince William Sound following the *Exxon Valdez* oil spill (Matkin et al. 1994). However, the increased mortality could not be directly attributed to the *Exxon Valdez* oil spill. Killer whales inhabit Cook Inlet during the summer; the number of killer whales is unknown. Consequently, any impacts from an oil spill would most likely occur at the individual level. Increased noise and disturbance from oil spill response and cleanup activities would have similar impacts as construction, due primarily to increased vessel and aircraft traffic. Potential impacts on killer whales due to oil spills from the Osprey Platform or a pipeline rupture are expected to be negligible to minor at the population level.

**Harbor and Dall's Porpoise.** The effects of oil spills on harbor and Dall's porpoises are expected to occur through ingestion of contaminated prey (Geraci 1990; Würsig 1990). Bioaccumulation of toxins could lead to fatalities; however, if fatalities occur, they are expected to be few and have a negligible effect at the population level. In general, both species are wide-ranging and could avoid areas contaminated by oil. However, harbor porpoises inhabit more nearshore areas and thus may be more affected by oil spills than Dall's porpoises. MMS (1996b) estimated that effects of a 50,000-barrel oil spill on harbor and Dall's porpoises would be minimal. An oil spill would most likely displace individuals from the contaminated area for several months. A few individuals may experience moderately adverse effects from contact with oil. Increased noise and disturbance from oil spill response and cleanup activities would have similar impacts as construction, due primarily to increased vessel and aircraft traffic. Potential impacts on harbor porpoise and Dall's porpoise due to oil spills from the Osprey Platform or a rupture in the pipeline are expected to be negligible to minor at the population level of either species.

**Harbor Seal.** Harbor seals are year-round residents of Cook Inlet. Oil spills could affect harbor seals directly by causing toxic stress and displacement and indirectly by altering forage availability. Cleanup activities may also physically disturb and displace harbor seals. Studies following the *Exxon Valdez* oil spill showed a significant decline in abundance of harbor seals at oiled sites in Prince William Sound soon after the spill, and at least 302 seals were missing at that time (Frost et al. 1994a). Elevated concentrations of hydrocarbons and other oil traces were found in tissue samples and bile of harbor seals found dead or collected from oiled areas in 1989 (Frost et al. 1994b). One year later, they found no elevated levels of hydrocarbons in harbor seal tissue taken from Prince William Sound, but oil traces were still present in bile samples. Likewise, Spraker et al. (1994) collected tissue samples from 27 seals in both oiled and non-oiled areas in 1989. Conjunctivitis, skin irritation, and liver and brain lesions were more common in oiled seals. Spraker et al. (1994) hypothesized that the damage was reversible in most cases. Nineteen seals found dead in the Sound or at rehabilitation centers also were examined. Thirteen of the 19 seals were pups and probably died due to oil toxicity or stress-related effects, while two adults were killed by blunt trauma, possibly during cleanup activities. Based on MMS (1996b) estimates, a limited number of harbor seals could die as a result of a 50,000-barrel spill in lower Cook Inlet. Increased noise and disturbance from oil spill response and cleanup activities would have similar impacts as construction, due primarily to increased vessel and aircraft traffic. Oil spills from the Osprey Platform or a rupture in the pipeline are expected to have minor to moderate impacts on local populations. Pups are more susceptible to the toxic effects of oil and stress.

**Sea Otter.** Sea otters rely solely on their fur for insulation (Rotterman and Simon-Jackson, 1988) and regularly groom themselves to maintain proper insulation. For these reasons, the species is highly vulnerable to direct oil contamination. Other long-term effects from an oil spill on sea otter populations include loss or contamination of prey, and physiological changes from ingesting contaminated forage and from direct oiling.

Although helicopter surveys following the *Exxon Valdez* oil spill did not detect significant decreases of sea otter abundance in oiled areas, boat-based surveys indicated a 35 percent decline in oiled areas of Prince William Sound. Garrott et al. (1993) estimated an acute mortality of 2,800 sea otters resulting from the spill. Agler and Kendall (1997) concluded that sea otter populations in the spill areas showed continued effects from the *Exxon Valdez* spill, even though limited baseline data has restricted their ability to determine injury and assess recovery. Doroff and Bodkin (1996) determined that prey composition and foraging success of sea otters did not differ among oiled and non-oiled study sites two years after the spill. Tissues of subtidal bivalve prey did not differ in the amount of hydrocarbons present throughout the study area. However, juveniles were found to feed more frequently in intertidal regions. This would put them at greater risk of chronic exposure to hydrocarbons, as Babcock et al. (1993) found mussel tissues sampled in 1989 to 1992 from intertidal regions of untreated oiled beaches to exhibit hydrocarbon concentrations similar to crude oil. In 1993, hydrocarbon concentrations in sediments and mussels were 50 percent lower than in 1992 (Babcock et al., 1996). From 1996 to 1998, Ballachey et al. (1999) examined CYP1A levels, a biomarker of hydrocarbon exposure, found in blood samples taken from sea otters in the oiled and non-oiled areas of Prince William Sound. Nine years after the spill, sea otters in the oiled areas have elevated CYP1A levels, indicating continued exposure or lingering signs of oil. They concluded that no relation between CYP1A and individual health or condition could be detected, and the effect of chronic oil exposure on future population recovery is not known.

Sea otters are sensitive to the impacts of oil spills and direct mortality of individual sea otters can result. Population level impacts appear to have resulted from the *Exxon Valdez* spill, and depending on the location, future spills could result in major population level effects, depending on the area. Although the number of sea otters inhabiting Cook Inlet is unknown, they are found primarily in lower Cook Inlet. Effects from an oil spill from the Osprey Platform would have moderate impacts to sea otters inhabiting the lower portion of the inlet. Increased noise and disturbance from oil spill response and cleanup activities would have similar impacts as construction, due primarily to increased vessel and aircraft traffic. Overall, oil exposure due to spills associated with the Osprey Platform could result in moderate and long-term impacts to sea otters in Cook Inlet.

### 4.7.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** During construction, about 20 acres of seafloor (and corresponding benthic habitat) would be disturbed under this alternative. The location of the pipeline would bring construction activities in closer proximity to major concentrations of birds at the Redoubt Bay Critical Habitat Area. If conducted during the nesting season, construction activities could adversely impact marine birds. The potential impacts of a blowout from the Osprey Platform described above for the proposed project would also apply to Alternative 2. Additional underwater pipeline would be installed for Alternative 2 (3.3. miles, compared to 1.8 miles for the proposed project); the increased pipeline length will increase the likelihood of a pipeline rupture. The impacts of a major oil spill on marine biological resources (lower trophic-level, fish, marine bird and mammal populations) would be comparable for the proposed project and Alternative 2.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** During construction, about 63 acres of seafloor (and corresponding benthic habitat) would be disturbed under this alternative. The potential impacts of a blowout from the Osprey Platform described above for the proposed project would also apply to Alternative 3. Additional pipeline would be installed (10.5 miles, compared to 1.8 miles for the proposed project), which will increase the likelihood of a pipeline rupture. The impacts of a major oil spill on marine biological resources (lower trophic-level, fish, marine bird and mammal populations) would be comparable for the proposed project and Alternative 3.

***Alternative 4 (No Action).*** Alternative 4 is a no action scenario that involves no construction or production operations and therefore would have no environmental consequences on marine biological resources.

### 4.7.5 Cumulative Impacts

Construction impacts are short-term and localized, and are not expected to contribute to cumulative impacts on marine biota.

As discussed in Section 4.5 (Marine Water Quality), wastewater discharges from the Osprey Platform are minimal, and their contributions to the cumulative loading of contaminants in Cook Inlet are anticipated to be negligible. Thus, there would be no cumulative impacts to marine biological resources from the discharges associated with the Osprey Platform.

The likelihood of oil and other contaminant spills increases with increased industrial activity in Cook Inlet. Damage caused by oil contamination would depend on the size and duration of the spill, time of year, and biota density. Multiple spills would further contribute to cumulative effects. Cumulative effects on the described marine resources in Cook Inlet due to oil spill accidents would range from negligible to moderate, depending on the scope of the spills.

### 4.7.6 Mitigation Measures

The following applicable mitigation measures have been identified to minimize environmental impacts on marine biological resources:

- Timing of construction activities to avoid bird nesting periods, migrating waterfowl and shorebirds, and nearshore migrating fish.
- Monitoring of water quality to ensure compliance with water quality criteria.
- Installation of overfill protection and secondary containment on tanks.
- Use of blowout preventers and monitoring of drilling weight to minimize the potential for a well blowout.
- Installation of a SCADA monitoring and control system.

- Internal and external monitoring of pipelines.
- Use of periodic side scan sonar surveys (at least every 2 years) to inspect the integrity of the pipelines and conduct remedial actions if potential problems are observed.
- Preparation and adherence to an ADEC-approved Oil Discharge Prevention and Contingency Plan (C-Plan).
- Preparation and adherence to Facility Response Plans as required by the Oil Pollution Act of 1990.
- Preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan as required by EPA.
- Maintain membership in CISPRI, a federally-approved Oil Spill Removal Organization.

## 4.8 THREATENED AND ENDANGERED SPECIES

Threatened and endangered species that could occur near the project site include: Steller's eider, short-tailed albatross, fin whale, humpback whale, blue whale, northern right whale, and Steller sea lion. In addition, beluga whales have been identified as depleted under the Marine Mammal Protection Act and are included in this section as a cetacean of special concern.

Potential environmental impacts to endangered and threatened species may result from noise and other disturbances during construction, wastewater discharges during normal operations, and effects of accidental oil spills. Sections 4.8.1 through 4.8.3 describe potential impacts associated with the proposed project; potential impacts of Alternatives 2, 3, and 4 are discussed in Section 4.8.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.8.5 and 4.8.6, respectively.

### 4.8.1 Impacts During Construction

Construction impacts associated with the proposed project are not likely to impact threatened and endangered species because of their infrequent occurrence near the project site. Beluga whales, however, could be impacted by noise and vessel traffic associated with construction activities. Belugas display a variety of behavioral responses, ranging from tolerance to extreme sensitivity, to noise and vessel traffic which may occur during construction activities. Reactions depend greatly on the whale's behavior, habitat, boat type, and boat activity. In areas where belugas are hunted by boat, such as Cook Inlet, small vessel traffic has been known to alter local distribution (Seaman and Burns 1981; Burns and Seaman 1986; Caron and Smith 1990). Beluga reactions to vessels traveling at slow to moderate speed on steady courses are less than those to vessels moving faster or erratically (Blane 1990; Blane and Jaakson 1994). Conversely, larger vessels traveling in a consistent direction are tolerated greatly by belugas (Fraker 1977; Macfarlane 1981; Sergeant 1981, 1986; Burns and Seaman 1986; Pippard 1985).

Additional stress on the Cook Inlet stock of beluga whales caused by construction may reduce fitness and survivorship. Since the population is at a low level and in decline, any disturbances which could reduce fitness of Cook Inlet belugas could potentially impact the population, depending on the number of whales affected. However, construction activities are anticipated to be short-term and localized and are therefore unlikely to significantly impact belugas

### 4.8.2 Impacts During Normal Operations

Potential impacts on threatened and endangered species during normal operations could result primarily from Osprey Platform discharges, including sanitary waste, deck drainage, domestic waste, non-contact cooling water, excess cement slurry, fire control system test water, and boiler blowdown. The discharges are described in Section 2.2.1; impact on water quality are discussed in Section 4.5. Potential impacts of wastewater discharges on threatened and endangered species were evaluated as part of a Biological Assessment (BA) prepared for the Osprey Platform in compliance with Section 7 of the ESA. The BA is provided as Appendix B to this EA; conclusions of the BA are summarized below.

#### 4.8.2.1 Steller's Eider

Steller's eiders are only occasional winter visitors to the western side of Cook Inlet. Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller's eiders, nor is the action likely to adversely affect or jeopardize the threatened Alaska nesting populations or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller's eiders or their proposed critical habitat.

#### 4.8.2.2 Short-tailed Albatross

The Short-tailed albatross has not been observed in the coastal waters of Cook Inlet since prior to 1947. Therefore, wastewater discharges associated with the Osprey Platform will not likely have any direct, indirect, or cumulative impacts on the Short-tailed albatross. Neither will it jeopardize the recovery of this species.

#### 4.8.2.3 Fin, Humpback, Blue, and Northern Right Whales

Humpback and fin whales are not be found regularly above Kachemak Bay; blue and northern right whales would be only accidental visitors to lower Cook Inlet. Discharges from the Osprey Platform are not likely to directly or indirectly impact any of the four endangered whale species, nor is the action likely to adversely affect or jeopardize the endangered Alaska populations or their critical habitat. The proposed project also will not have incremental effects resulting in a cumulative effect to these species.

#### 4.8.2.4 Steller Sea Lion

A small number of Steller sea lions may occur near the project area. Discharges from the Osprey Platform will be diluted by the strong tidal flux of Cook Inlet, however, and any disturbance of Stellar sea lions would be very short-term and unlikely to adversely affect the animals.. Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller sea lions, nor is the action likely to adversely affect or jeopardize the threatened Alaska population or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller sea lions or their proposed critical habitat.

#### 4.8.2.5 Cetacean of special concern -- Beluga whale

Wastewater discharges from the Osprey Platform will occur outside areas in Cook Inlet where large concentrations of belugas are present during the summer (NMFS 2000d). Although the platform will be operated year-round, the West Foreland is not heavily used by beluga whales (Smith and Mahoney 1999). The volume and concentration of pollutants in the discharges from the platform are minimal; once released, the discharges will be rapidly dispersed by the strong tidal fluxes in Cook Inlet. Therefore, it is unlikely that wastewater discharges would directly or indirectly affect Cook Inlet belugas or their critical habitat. The proposed actions are also not likely to have incremental effects resulting in a cumulative impact to this species.

### 4.8.3 Accidents

The following sections consider the impact on threatened and endangered species of a major oil spill from a well blowout at the Osprey Platform or an underwater pipeline rupture. A well blowout could release 5,500 barrels per day of crude oil; a pipeline rupture could release 1,633 barrels of crude oil. A spill of this magnitude could potentially occur, but is not likely to occur during the life of the project (see Section 4.1.4).

#### 4.8.3.1 Steller's Eider

Although Steller's eiders have not been reported in the project area they do winter in shallow, nearshore marine habitats of lower Cook Inlet (both the eastern and western sides of the Inlet) where they feed on benthic invertebrates and amphipods. Habitat use in upper Cook Inlet is currently unclear. Molting and wintering birds could be affected by oil spills either by direct contact with oil, ingestion of oil from preening oil-soaked feathers, or from contaminated food sources. MMS (1996b) estimated that less than 2 percent of the winter population of Steller's eiders could be impacted from a spill in lower Cook Inlet. The impact may be considerably less for a spill that occurs in the upper Cook Inlet; the level of impact will depend on the timing, size, and location of the spill. Since a major oil spill (such as a well blowout or pipeline rupture) is unlikely, the proposed project may affect but is not likely to adversely affect Steller's eiders.

#### 4.8.3.2 Short-tailed Albatross

Annual observations of the short-tailed albatross, a pelagic seabird, have been recorded in the Gulf of Alaska and the North Pacific since 1947. The short-tailed albatross has not been observed in the coastal waters of Cook Inlet since observations began (1947 through 1999) (AKNHP 2000; IPHC 1999). Therefore, impacts on the short-tailed albatross from an oil spill associated with the Osprey Platform will be negligible.

#### 4.8.3.3 Fin, Humpback, Blue, and Northern Right Whales

Oil spills could cause the following temporary, nonlethal effects in fin, humpback, blue, and northern right whales: inhalation of hydrocarbon vapors, a loss of prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling that would reduce feeding efficiency, and skin and/or sensory-organ damage. Because individual whales, especially, fin and humpbacks, may only be present in lower Cook Inlet during the summer, but are rarely present in the upper Cook Inlet, it is improbable that many whales would be affected by an oil spill. Consequently, effects on endangered whales from exposure to an oil spill are expected to be minimal.

#### 4.8.3.4 Steller Sea Lion

Although not present in the project area, Steller sea lions inhabit some areas in the lower Cook Inlet and individual sea lions may occur regularly in the upper inlet. In Cook Inlet, the only possible impact to Steller seal lions would be a major oil spill. Oil would affect sea lions if it directly contacted individuals, rookeries, haul-outs, or major prey species. In addition, vessel and human activity associated with cleanup efforts may cause sea lions to abandon coastal haul-out areas and/or rookeries for an extended period of time.

Oil spills would have the most severe impact on Steller sea lions during late spring, summer, and early fall, when they are concentrated at rookeries. At these times, any spill and/or cleanup operation has the potential to disturb hundreds of sea lions. If a rookery was contaminated with oil, the current rate of population decline could accelerate significantly (Calkins et al. 1994). Overall, with the current population declines in Alaskan waters, any oil spill could potentially impact the population, depending on the size, location and timing of the spill, as well as the number of spills per season.

Direct contact with oil would affect sensitive tissue areas of adult sea lions, causing irritation to eyes, nasal passages, and lungs. Contamination of pups could have more long-term effects. A decline in prey species due to oil contamination could increase sea lion mortality. This effect would probably be more long-term on the population as a whole than would direct contact with a spill itself.

For a spill in lower Cook Inlet, MMS (1996b) estimated less than 100 sea lion deaths, where recovery would take approximately one generation. For a major spill in upper Cook Inlet, the impact would be even lower.

Cleanup operations, including helicopter overflights and vessel traffic, could also potentially increase pup mortality if operations occurred near rookeries. Steller sea lions are very easily disturbed while in their rookeries, and adults may stampede into the water, trampling pups. Any increased mortality in the sea lion population could impact the population as a whole, given the current severe state of decline.

Steller sea lions can be found in the general region where the Osprey Platform will operate. However, no rookeries or haul-outs are located in the project area (the nearest rookery and haul-out are located on the Barren Islands) and impacts would likely be expressed on an individual level. Therefore, while potential impacts on individual Steller sea lions could occur due to an oil spill associated with the proposed project, the project is not likely to adversely affect Steller sea lion populations or critical habitat. Specific impacts would depend on the time of year, size of the spill, and its potential movement.

4.8.3.5 <u>Cetacean of Special Concern -- Beluga Whale</u>

The beluga whale is the only year-round resident marine mammal in upper Cook Inlet. All other marine mammals observed in Cook Inlet are seasonal or accidental migrants into the upper inlet. Contact with oil could cause inhalation of hydrocarbon vapors, reduced prey availability, ingestion of spilled oil or oil-contaminated prey, and skin and/or sensory-organ damage. Cook Inlet belugas may be particularly sensitive to environmental stress. Oil spills could be fatal to individuals through direct contact or reduction in prey. Displacement caused by oil spills and cleanups could prevent access to important habitat areas where they feed. Any reduction in survivorship could be detrimental to the population. Therefore, a major oil spill associated with the proposed project could adversely affect the beluga population in Cook Inlet, depending on the size and timing of the spill. A major oil spill (such as a well blowout or pipeline rupture) is not expected to occur during the life of the project (see Section 4.1.4); mitigation measures described below will reduce the probability of a major spill and its consequences. Small oil spills could result in minor to moderate impacts on the Cook Inlet beluga population.

### 4.8.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** The potential impacts of a major oil spill as described above for the proposed project would also apply to Alternative 2. Additional underwater pipeline will be installed for Alternative 2 (3.3 miles, compared to 1.8 miles for the proposed project), thereby increasing the likelihood of a pipeline rupture. The impacts of a major oil spill on threatened and endangered species would be comparable for the proposed project and Alternative 2.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** The potential impacts of a major oil spill as described above for the proposed project would also apply to Alternative 3. Additional underwater pipeline will be installed for Alternative 3 (10.5 miles, compared to 1.8 miles for the proposed project), thereby increasing the likelihood of a pipeline rupture. The impacts of a major oil spill on threatened and endangered species would be comparable for the proposed project and Alternative 2.

***Alternative 4 (No Action).*** Alternative 4 is a no action alternative that involves no construction or production operations and therefore would have no environmental consequences on threatened and endangered species.

### 4.8.5 Cumulative Impacts

Construction impacts are short-term and localized, and are not expected to contribute to cumulative impacts on threatened and endangered species. As discussed in Section 4.5., wastewater discharges from the Osprey Platform are minimal, and their contribution to the cumulative loading of contaminants in Cook Inlet are anticipated to be negligible. No cumulative impacts on threatened and endangered species are expected to occur as a result of wastewater discharges during normal operations.

The likelihood of oil and other contaminant spills increases with increased industrial activity in Cook Inlet. Damage caused by oil contamination would depend on the size and duration of the spill, time of year, and biota density. Multiple spills would further contribute to cumulative effects. Cumulative effects on threatened and endangered species would range from negligible to moderate, depending on the scope and timing of the spills. In particular, the beluga whale population in Cook Inlet is at a low level and in decline. Additional stress on the Cook Inlet stock of beluga whales may reduce fitness and survivorship; any disturbances which reduce the fitness of Cook Inlet belugas could potentially impact the population.

### 4.8.6 Mitigation Measures

Applicable mitigation measures have been identified to minimize environmental impacts to threatened and endangered species, including actions that would reduce the probability of oil spills and the environmental consequences if a spill did occur. Applicable mitigation measures include:

- Timing of construction activities to avoid seasonal concentrations of beluga whales.
- Monitoring of water quality to ensure compliance with water quality criteria.
- Installation of overfill protection and secondary containment on tanks.
- Use of blowout preventers and monitoring of drilling weight to minimize the potential for a well blowout.
- Installation of a SCADA monitoring and control system.
- Internal and external monitoring of pipelines.
- Use of periodic side scan sonar surveys (at least every 2 years) to inspect the integrity of the pipelines and conduct remedial actions if potential problems are observed.
- Preparation and adherence to an ADEC-approved Oil Discharge Prevention and Contingency Plan (C-Plan).
- Preparation and adherence to Facility Response Plans as required by the Oil Pollution Act of 1990.
- Preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan as required by EPA.

- Maintain membership in CISPRI, a federally-approved Oil Spill Removal Organization.

## 4.9 TERRESTRIAL BIOLOGICAL RESOURCES

Potential impacts on terrestrial biological resources may result from construction activities, vehicle and aircraft traffic along roads and onshore pipelines, habitat loss and alteration, and oil spills from the Kustatan Production Facility or pipelines. Potential environmental impacts on terrestrial biological resources associated with the proposed project are described in Sections 4.9.1 through 4.9.3. Potential impacts of Alternatives 2, 3, and 4 are described in Section 4.9.4. Cumulative impacts and applicable mitigation measures are identified in Sections 4.9.5 and 4.9.6, respectively.

### 4.9.1 Impacts During Construction

4.9.1.1 Vegetation and Wetlands

The proposed project involves the construction of a 1.8-mile access road and pipelines through undisturbed areas from the bluff at the West Foreland to the proposed Kustatan Production Facility near Kustatan. A wetland survey of the road/pipeline alignment and proposed onshore production facility was conducted by Harding Lawson Associates for Forest Oil In September 2000 (HLA 2000). The survey indicated that the proposed alignments will cross small segments of four wetlands areas (Figure 3-4); these areas will require a Corps of Engineers Wetlands Permit. Wetlands mitigation and restoration requirements posed by the Corps of Engineers as part of the permitting process will need to be implemented.

Forest Oil has estimated that the proposed project would involve potential impacts to 29 acres of undisturbed area for pipeline placement and construction of the access road (NCG 2001). If the borehole method of pipeline placement at the bluff is determined to be technically feasible (see Section 4.2.1.1), disturbance will be reduced by about 3 acres. This represents less than 0.2 percent of the West Forelands area.

Four wetlands areas, totaling approximately 772 lineal feet of wetland are crossed by the proposed trail route (HLA 2000). Footage for each wetland crossed is as follows:

- FOR1: two crossings at 65 feet and 125 feet
- FOR2: 177 feet
- FOR3: 363 feet
- FOR7: 42 feet

Assuming a 25-foot wide road, plus potential disturbance to 50 feet on either side of the road, about 2.2 acres of wetland could potentially be impacted. Rerouting the access road as discussed in Section 4.9.1.6 below would reduce the area of wetlands potentially impacted by the proposed project. Approximately 363 feet of crossing (FOR3 on Figure 3-4) can be avoided by rerouting the access road slightly to the north.

Because of the relatively small area of wetlands that will be impacted by the construction of the proposed project, the construction impacts of the proposed project on onshore wetlands and vegetation is expected to be minor.

4.9.1.2 Birds

Terrestrial birds may be impacted by noise from construction activities if onshore clearing is conducted after nesting begins. Most clearing activities are normally either conducted within several weeks of winter breakup (prior to birds nesting) or after birds have left the nest by mid summer. The access route to the tip of the West Foreland was cleared in the winter of 2000 to provide tracked vehicle access to the area to conduct soils borings. The timing of these actions would have avoided bird nesting periods. Similarly, if construction activities for roads and pipelines are conducted outside of critical nesting periods such as nesting for trumpeter swans and Tule white-fronted geese in the Redoubt Bay area, potential impacts will be minimal.

On a rare occasion, a peregrine falcon may be disturbed by aircraft traffic to the drill rig; avoidance responses are anticipated to have only short-term effects (a few minutes to tens of minutes). Exposure to disturbance, however, is expected to be infrequent with minimal effects to the population due to the limited number of flights and the transient behavior of overwintering peregrines (MMS 1995).

4.9.1.3 Terrestrial Mammals

The construction of access roads, onshore pipelaying operations, and construction of the Kustatan Production Facility may result in minor habitat loss and alteration. The area of disturbance is not within a known or designated critical habitat area for terrestrial wildlife, and affects only a small percentage of the undeveloped land in the West Foreland area. Construction activities may result in short-term impacts to seasonal use patterns of brown and black bears. Human-bear interactions could result in the loss of individual bears. Construction activities may also result in short-term and localized impacts on terrestrial mammals from noise. Overall, construction impacts on terrestrial mammals are expected to be minor.

### 4.9.2 Impacts During Normal Operations

Fugitive dust and emissions from vehicles traveling along the access road could result in adverse impacts on surrounding wetlands areas and vegetation. However, because the road is intended for maintenance, and access to trespassers is limited by the inaccessibility of the area, the frequency of vehicles on the access road should be low. Potential impacts to wetlands and vegetation from normal operations is anticipated to be negligible.

The possible increase in aircraft and supply-boat traffic to and from the Osprey Platform may potentially disturb birds and terrestrial mammals along the traffic routes when occurring near shore. The impacts from increased traffic, however, are expected to have only short-term effects (a few minutes to less than an hour). Displacement of terrestrial mammals is expected to last less than one hour. It is anticipated that operational noises resulting from the proposed Kustatan Production Facility would be mimimal. Offshore platform operations are not expected to affect terrestrial wildlife.

### 4.9.3 Accidents

4.9.3.1 Vegetation and Wetlands

Onshore oil spills that impact upland or wetlands habitat could potentially occur. An oil tank rupture at the onshore production facility could result in the release of 25,000 barrels (about one million gallons) of crude oil; a produced water tank rupture could cause the release of 5,000 barrels of produced water. An onshore pipeline leak/rupture could result in the release of up to 1,633 barrels (70,000 gallons) of crude oil. Spills could result in damage to wetlands areas, including terrestrial flora and fauna. Although potential impacts to wetlands areas are likely to be short-term, impacts on these areas would be significant if a major oil spill were to occur. Small spills are likely to occur during the 20-year estimated project life, and would be expected to have a moderate impact on vegetation and wetlands. Small spills would likely be "contained" in small ponds or pools, rather than drain into Cook Inlet. With construction of the access road, spill response equipment can be readily mobilized and access to the potentially affected area is increased. Mitigation measures outlined in Section 4.9.6 could reduce the probability and magnitude of an onshore oil spill.

#### 4.9.3.2 Birds

The effects of spills on birds is well documented (MMS 1996b, Wells et al. 1995). Direct oil contact alone is usually fatal and often results in substantial mortality of many birds. Oiling of birds causes death from hypothermia, shock, or drowning. Oil ingestion through preening of oiled feathers significantly reduces reproduction in some birds and causes various pathological conditions, significant weight loss, and reduced growth in young birds. Oil contamination of eggs by oil-covered feathers of parents also significantly reduces egg hatching through toxic effects on the chick embryo or by abandonment of the eggs, chicks and nest by parent birds. These effects would be primarily associated with waterfowl and shorebird populations, but could also extend to eagles and other predator species (such as eagles) that often use intertidal areas. The most sensitive timing would be during the summer when waterfowl and shorebirds are abundant in the area.

Bird populations could take up to three generations (less than 15 years) to recover from a major oil spill (MMS 1995). Habitat contamination may persist for several years after the spill, and impacts on bird reproduction would be expected to persist for more than one year. The extent of the impacts could be moderate to major depending on a number of factors including size of the oil spill, quality and quantity of affected habitat, and number of birds using the affected area.

Migrating or overwintering peregrine falcons could occur seasonally in the proposed sale area, however such occurrence is anticipated to be uncommon (less than 3 percent of the Alaskan population). Oiling, ingestion of oil, or indirect effects from reduction in prey may impact peregrine falcons in the vicinity of an oil spill. However, due to the infrequent occurrence of peregrines in the area, their foraging habits, and low probability of contact where peregrines might occur, the effect to the peregrine falcon is expected to be minimal (MMS 1995).

#### 4.9.3.3 Terrestrial Mammals

The primary impacts associated with a potential oil spill on terrestrial mammals result from the oil contamination of individual mammals, degradation of coastal habitats, and contamination/reduction of food sources (vegetation, prey, and carrion). The following discussion describes impacts to mammals most likely to be affected by a major oil spill.

***Brown and Black Bears.*** Coastal streams, beaches, mudflats, and river mouths are important bear habitat during the summer and fall months. An oil spill in such habitats would likely result in the ingestion of oil-contaminated food sources such as clams, mussels, and carrion by some brown bears resulting in the mortality of a few to several bears. In addition the ingestion of considerable quantities of oil through grooming of oiled fur may also result in death (Oritsland et al., 1981).

Ingestion of oiled prey from contaminated intertidal habitat could persist for a number of years after the spill. This exposure to oil may result in sublethal effects on the fitness of some bears and a decline in survival of those bears exposed. Recovery of bears and associated habitat could take several years. However, regional populations are not likely to be impacted.

***Coastal River Otters.*** Coastal beaches, tidal flats, and nearshore marine waters are utilized by river otters for feeding and movements. Due to the considerable amount of time spent feeding in coastal marine waters and foraging along the shoreline, river otters are considered to be at particular risk to direct oiling. Oil contamination of otter habitat could result in the contamination of food sources, direct oiling, and oil ingestion and inhalation of oil-vapor through grooming and consumption of oiled prey. In addition, river otters may also be affected by tissue damage and hemolytic anemia, significant reduction in body mass, reduced diet diversity, avoidance of preferred habitats, loss of thermal insulation, and increases home ranges resulting from exposure to oil (Faro, Bowyer, and Testa, 1991; Tarasoff, 1974). Total recovery of river otters and associated habitat could take as long as three years. Regional populations are not likely to be impacted.

A series of smaller spills may have an additive effect on local wildlife, perhaps increasing losses and habitat contamination.

### 4.9.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** For Alternative 2, the affected area would be the location of the proposed Kustatan Production Facility as well as the area where the underwater pipeline is brought onshore and enters the production facility. Therefore, the 1.8 mile access road would not be constructed across undisturbed area. A total of 14 acres of land would be disturbed under this alternative (NCG 2001). Impacts on wetlands from construction of Alternative 2 are judged to be negligible to minor. Because Alternative 2 does not involve construction of the 1.8-mile pipeline from the West Foreland to the Kustatan Production Facility, spills and tank ruptures from the Kustatan Production Facility itself are the primary source of potential terrestrial impacts. Potential impacts are expected to be moderate to major if a large oil spill were to occur. Mitigation measures outlined in Section 4.9.6 would reduce the probability and magnitude of an onshore oil spill.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Alternative 3 does not involve construction of the Kustatan Production Facility, thus would not require a pipeline or access road. It would, however, include a 0.1-mile length of onshore pipeline to the Trading Bay Production Facility. Less than 1 acre of total area would be disturbed (NCG 2001). Impacts on wetlands from construction of Alternative 3 are expected to be minor. A pipeline rupture along the 0.1-mile onshore pipeline could result in the release of 1,075 barrels (45,000 gallons) of crude oil (NCG 2001). Potential impacts are believed to be moderate if the mitigation measures identified in Section 4.9.6 are implemented.

***Alternative 4 (No Action).*** Alternative 4 is the no action alternative and would not result in additional disturbances to any onshore terrain, including wetlands, or to terrestrial birds or mammals.

### 4.9.5 Cumulative Impacts

Other access roads are present in the immediate area of the proposed project. A 3.5-mile access road was recently constructed from the proposed Kustatan Production Facility (site of the Tomcat Exploratory Well) to West Forelands #1. This road involves disturbance of 12 to 16 acres of previously disturbed areas. This road and other roads from West Forelands #1 to the West McArthur River Unit and Trading Bay Production Facilities to the north were designed to avoid wetlands areas to the extent possible. Cumulative impacts from the addition of the proposed production facility and onshore road/pipeline are considered to be minor.

The cumulative effects of ongoing and future development could result in potential habitat alteration, environmental degradation from a series of smaller spills, and direct mortality effects on these and other terrestrial mammals that reside in the Cook Inlet region. Contribution of the proposed project to cumulative impacts on terrestrial biological resources is expected to be minor.

#### 4.9.6 Mitigation Measures

The following applicable mitigation measures were identified to avoid terrestrial impacts, minimize the potential for an oil spill, and reduce the impacts of an oil spill if one were to occur.

- Eliminate impacts to approximately 363 feet of wetland crossing by rerouting the access road slightly to the north.
- Conduct wetlands mitigation and restoration activities as specified by a Corps of Engineers Wetlands Permit.
- Avoid clearing and other noise-producing construction activities during periods when major concentrations of nesting birds may be in the area.
- Install overfill protection and secondary containment on tanks.
- Install and maintain a SCADA monitoring and control system.
- Perform internal and external monitoring of pipelines.
- Prepare and adhere to an ADEC-approved Oil Discharge Prevention and Contingency Plan (C-Plan).
- Prepare and adhere to Facility Response Plans as required by the Oil Pollution Act of 1990.
- Prepare a Spill Prevention Control and Countermeasures (SPCC) Plan as required by EPA.
- Maintain membership in CISPRI, a federally-approved Oil Spill Removal Organization.

### 4.10 Socioeconomic Impacts

Potential impacts on the local economy include increased revenues from oil activities, increases in employment and population, and gains/losses from oil spills and cleanup events, including commercial fishing and subsistence harvests at the community level. The proposed project could result in both positive and negative impacts. Positive impacts could result both to the local oil and gas service industry and to the local economy in general. Possible negative impacts could result to the commercial fishing industry and possibly to the tourism industry in the event of a major oil spill. These are discussed below.

#### 4.10.1 Impacts During Construction

Construction activities are anticipated to occur during the second half of 2001; the project is scheduled to begin operations during the first quarter of 2002 (NCG 2001). The estimated cost to construct and install pipelines, roads, and a production facility to treat the oil, gas and water from the Osprey Platform is approximately 75 million dollars (Amundsen 2000b). Roughly 80 to 90 percent of these dollars will pass through the local economy of upper Cook Inlet. Temporary employment during the peak of construction is estimated at 60. Although local residents would not fill all of these jobs, it is assumed that some direct local employment (at least 20 to 30 temporary positions) will occur. Permanent employment opportunities would likely be less than 10 additional persons, because it is expected that personnel involved in the existing production operations at the West McArthur River Unit can handle many of the new duties.

During construction activities, there may be conflicts in the availability of local resources including lodging, restaurants, etc. between local residents, tourists, sports fishermen, and other recreational users. However, increased demands for these services will provide added local income (and taxes) for the area.

Most of the direct local economic impacts will be short-term and disappear when construction activities have been completed. Overall, these impacts (both positive and negative) are considered to be minor for the proposed project.

Socioeconomic impacts on the commercial fishing industry could occur during construction; these potential impacts are associated with potential use conflicts during pipeline construction activities, especially near the shore approach for the pipeline. Construction impacts would likely be limited to the tip of the West Foreland where the underwater pipeline comes ashore. Although there are no registered set net fishery sites at this location (NCG 2001), there is at least one set net operation known to be located in the immediate vicinity of the shore approach for the pipeline that could potentially be disturbed. To the extent possible, construction activities in these areas will be planned to occur during periods when these seasonal fisheries are not active (NCG 2001). With proper coordination, these impacts are estimated to be minor for the proposed project.

### 4.10.2 Impacts During Normal Operations

Socioeconomic impacts during normal operations would primarily be positive ones associated with oil and gas production. Increased oil and gas activities in the past several years have enhanced local employment opportunities to some extent; however, there is still additional local capacity for new projects. Any additional or new oil and gas development is certain to have a positive direct and indirect impact on the local oil and gas service industries in the area. An estimated production of 25,000 bbl/day from the Redoubt Shoal Unit Development Project would result in an approximate 90 percent increase in current oil production from the Cook Inlet area.

Direct benefits would include local employment and increased requirements for local service contractors. Direct benefits would also result to the local and state government in the form of tax and royalty revenues. During the production drilling phase (about three years), approximately 36 million dollars per year will pass through the local economy (Amundsen 2000b). This will provide 55 full-time jobs in support of the drilling activity. Ongoing periodic drilling and workover activities will continue to occur over the useful life of the facility. During the production phase (about 20 years), the State of Alaska will receive 7.5 million dollars per year in royalties. The project will generate about 2 million dollars per year in property taxes. The severance taxes will amount to 1.5 million dollars. Operations and maintenance spending is estimated at 2 million dollars per year. The project will support 10 full-time employees (Amundsen 2000b).

Indirect benefits are also likely for downstream users of the oil (and possibly gas) including the Cook Inlet Pipe Line Company (who will haul the oil) and Tesoro Alaska Petroleum Company (who will likely refine the oil). Other potential benefits include the sharing of the Cook Inlet infrastructure, which will reduce the costs to the existing facilities in Cook Inlet.

### 4.10.3 Accidents

Potential socioeconomic impacts resulting from accidents include negative impacts on the commercial fishing industry in the area. It is expected that the salmon fisheries in the central and upper inlet (areas above Anchor Point) would be the primary industry sector affected by a major oil spill in the upper inlet. The primary impacts to commercial fishing operations from a major spill would include fishing closures, real and perceived fish tainting, and oiling of gear; all could have direct economic impacts.

During the ten year period between 1987 to 1996, the commercial fishing industry in the central and upper inlet averaged about 50 to 60 million dollars in income (Ruesch and Fox 1997); only 2 to 3 percent of this amount occurred in the upper inlet (above the Forelands). Falling salmon prices have resulted in lower prices in the more recent years (average of about 30 million dollars during the period of 1993 to 1996; NCG 2001).

Possible economic losses to the commercial fishing industry from a major spill could to some extent be mitigated by employment of personnel in spill response activities and through direct compensation (through either negotiated or legal settlements with the industry participants). As exhibited by actions following the two larger spills in the general area (*Glacier Bay* and *Exxon Valdez* oil spills), both would likely occur. Potential impacts to the commercial fishing industry could be major but short-term in the event of a spill.

### 4.10.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Socioeconomic impacts associated with this alternative would be the same as for the proposed project (Alternative 1).

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Socioeconomic impacts associated with this alternative would be the same as for the proposed project (Alternative 1). Potential impacts on commercial fisheries might vary somewhat, given the increased oil spill potential along the longer underwater pipeline (10.5 miles) under this alternative. No information was readily available about set net or other commercial fishing operations in the Trading Bay area near the pipeline shore approach during the preparation of this EA.

***Alternative 4 (No Action).*** Under this alternative, no socioeconomic impacts (positive or negative) would result.

### 4.10.5 Cumulative Impacts

Within the context of existing regional conditions, the addition of one offshore platform and 7 miles of pipeline (3 pipelines, 1.8 miles each) will not add significantly to potential cumulative effects from oil and gas operations in Cook Inlet. Activities may slightly offset effects of reduced oil production in the region by providing direct and indirect employment and economic benefits to the local communities.

### 4.10.6 Mitigation Measures

To minimize disturbance to set net fishing operations in the vicinity of the West Foreland, construction activities should be scheduled during periods when these seasonal fisheries are not active.

Mitigation measures to minimize the likelihood of a major oil spill and to reduce the environmental impacts of a spill if one were to occur have been listed in previous sections (see Sections 4.4.6 and 4.5.6).

## 4.11 IMPACTS ON SUBSISTENCE HARVESTING

Subsistence harvesting is the customary and traditional use by rural Alaska residents of wild, renewable resources for direct personal or family consumption or for customary trade. Impacts on subsistence harvesting patterns may occur from oil spills, industrial disturbance (including noise), construction activities, reduced access to resources, and changes in subsistence practices related to oil and gas activities, increased population and industrial employment. These are discussed below.

### 4.11.1 Impacts During Construction

The primary impact during construction would be associated with interruption of subsistence set net fisheries at the shore approach. Through coordination of construction activities with local residents (i.e., scheduling disruptive activities when the seasonal fishing activities are not occurring), potential conflicts can be avoided and are expected to be minor. Noise associated with construction activities may influence behavior of fish, birds, and mammals associated with subsistence harvesting activities. Construction-related impacts are expected to be short-term and negligible.

### 4.11.2 Impacts During Normal Operation

Increased population and industrial employment can create limitations to subsistence practices by reducing access to subsistence resources. However, the proposed project will provide only a limited number of jobs locally; development pressures as a result of this project are anticipated to be minimal. Under normal operations, no impacts are expected to occur on any plant or animal species associated with subsistence harvesting activities.

### 4.11.3 Accidents

Potential effects on subsistence activities would result primarily from a major oil spill in the upper inlet. Because of its proximity, the community of Tyonek would likely be the greatest impacted. Other communities in which subsistence is a major activity (such as Nanwalek and Port Graham in the lower inlet) might also be impacted by a major spill, but to a much lesser extent because of their greater distance from the proposed project area.

Specific impacts to subsistence would include the possible loss of access to key subsistence food items and subsistence habitats. Specific food items potentially at risk include fish (salmon and hooligan), intertidal benthic organisms (clams), marine mammals (beluga whale and harbor seals), and birds (ducks and geese).

If a major spill were to occur, impact could be significant but would be relatively short-term (one to three years). In the absence of a major spill, impacts will be negligible.

### 4.11.4 Impacts of Alternatives

***Alternative 2 (Offshore Pipeline to Kustatan).*** Impacts on subsistence harvesting associated with Alternative 2 would be the same as for the proposed project. The underwater pipeline is 1.5 miles longer than for the proposed action, and therefore there would be a slightly higher probability of a pipeline spill. The magnitude of impacts on subsistence harvesting would be comparable.

***Alternative 3 (Offshore Pipeline to Trading Bay).*** Impacts on subsistence harvesting associated with Alternative 3 would be the same as for the proposed action. The underwater pipeline would be 8.7 miles longer than for the proposed action, and therefore there would be a slightly higher probability of a pipeline spill. The magnitude of impacts on subsistence harvesting would be comparable.

***Alternative 4 (No Action).*** Under the no action alternative, no construction or production operations would occur, and therefore there would be no environmental impact to subsistence harvesting.

### 4.11.5 Cumulative Impacts

Increased population and industrial employment can create limitations to subsistence practices. However, the proposed project will provide only a limited number of jobs locally; development pressures as a result of this project are anticipated to be minimal. Subsistence also tends to occur at locations where there is an abundance of fish and wildlife resources. If the proposed project were to affect the abundance of fish and other biota in Cook Inlet, it could contribute to cumulative impacts on subsistence harvesting. These potential cumulative impacts are expected to be minor.

### 4.11.6 Mitigation Measures

To a large extent, impacts associated with construction activities can be mitigated by scheduling construction activities to avoid harvesting periods and through close coordination (e.g., meetings) with local residents. Other appropriate mitigation measures include those that minimize the likelihood of a major oil spill and reduce the environmental impacts of a spill if one were to occur. These mitigation measures have been identified in previous sections (see Sections 4.4.6 and 4.5.6).

## 4.12 Land and Shoreline Use and Management Impacts

### 4.12.1 Impact of the Proposed Project

The underwater pipeline will cross areas of the central inlet. Pipeline systems currently exist in the general area of the proposed route. The primary industrial use of the central and upper inlet is by the oil and gas industry. There are no known existing uses that would conflict with this use of the seafloor area along the proposed route. The onshore pipeline route would follow existing pipeline right-of-ways, and there are no known use conflicts that would preclude installation of an additional pipeline along these routes.

The project will undergo a coastal zone management consistency review by the Alaska Division of Governmental Coordination to ensure that there are no conflicts with coastal zone management objectives. Overall, potential adverse impacts related to land use and management objectives are expected to be minimal to minor for the proposed project.

### 4.12.2 Impacts of Alternatives

Impacts of Alternatives 2 (offshore pipeline to Kustatan) and 3 (offshore pipeline to Trading Bay) on land and shoreline use would be the same as for the proposed project.

### 4.12.3 Cumulative Impacts

The proposed project would add new oil and gas facilities to the existing 15 offshore platforms, over 500 miles of offshore pipeline in the upper Cook Inlet, and associated onshore facilities along the shore of the inlet. Oil and gas exploration and development projects have been conducted in the Cook Inlet since the late 1950s onshore and since the mid-1960s offshore. The existing projects combined with the proposed project would have the potential to slightly exacerbate existing effects on land use. However within the context of regional conditions, the addition of proposed project facilities are not unusual and would only slightly add to the sum of incremental land use changes that have already occurred with oil and gas development in the upper Cook Inlet. Cumulative impacts on land and shoreline uses are deemed to be minor.

#### 4.12.4 Mitigation Measures

To the extent possible, Forest Oil would control/restrict public access to, in, and through areas that it owns (such as in the Kustatan area) or in areas under their operational control.

The proposed project will be permitted, constructed, and operated consistent with local, state, and federal land use and management procedures, objectives, codes, and regulations. Specific permits and approvals that will be required are summarized in Section 8. As part of the permitting process, Forest Oil is planning to conduct a series of public meetings at various locations potentially impacted by the project (NCG 2001). Meetings would tentatively be held in the Kenai/Soldotna area, Homer, and in Anchorage.

### 4.13 TRANSPORTATION SYSTEM IMPACTS

#### 4.13.1 Impacts of the Proposed Project

Potential impacts to transportation systems are associated with possible conflicts with existing vessel movements in the central inlet, primarily to and from the Port of Anchorage. Currently there are about 400 to 500 vessels that travel through the area each year on their way to the Port of Anchorage (see Section 3.12). The usable channel width for navigation in the area is about 7 to 9 miles, and the presence of the Osprey Platform should present no unusual or hazardous conditions for marine traffic through the area.

Construction impacts are expected to be minor; the pipelines are close to shore (1.8 miles) and located in relatively shallow water. The platform has also been placed in relatively shallow water, immediately west of the deeper main channel passing between the Forelands. Collisions with the platform are unlikely; it is located outside the main shipping lanes, therefore large vessels should not be in close proximity to the Osprey Platform. For both large and small vessels, the presence of the platform may actually serve as a navigation aid. Appropriate U.S. Coast Guard navigation aids have been installed to ensure that the operation is visible to passing vessels.

Overall, the impacts to existing transportation systems are expected to be negligible to minor for the proposed project.

#### 4.13.2 Impacts of Alternatives

Impacts of Alternatives 2 (offshore pipeline to Kustatan) and 3 (offshore pipeline to Trading Bay) would be the same as for the proposed project. Alternative 4 (no action) would involve no construction or production operations and therefore would have no impact on transportation systems.

#### 4.13.3 Cumulative Impacts

The Osprey Platform is already in place; conversion to production operations will not contribute significantly to cumulative impacts on transportation systems in Cook Inlet.

#### 4.13.4 Mitigation Measures

No mitigation measures are necessary as no project impacts on transportation systems have been identified.

### 4.14 IMPACTS ON VISUAL ENVIRONMENT/AESTHETICS

#### 4.14.1 Impacts of the Proposed Project

The Osprey Platform will be visible over a wide area of central and upper Cook Inlet, both during the day and at night. Particularly sensitive viewing populations include: visitors to the Captain Cook State Recreation Area; and villagers from Tyonek. However, given the presence of 15 other platforms in the area, its presence would not significantly impact the existing visual environment.

Other potential impacts to the visual environment include impacts from a major oil spill. Major impacts could result locally from a large oil spill in the upper inlet. These impacts would be short-term and probably restricted to highly oiled beaches. Overall, the potential impacts on the visual environment are expected to be minor to moderate for the proposed project.

#### 4.14.2 Impact of Alternatives

Impacts on the visual environment of Alternative 2 (offshore pipeline to Kustatan) and 3 (offshore pipeline to Trading Bay) would be comparable to the proposed project. The alternatives include longer underwater pipelines and therefore would have a slightly higher probability of an oil spill. Under alternative 4 (no action), the Osprey Platform would be floated off-location, resulting in minor positive impacts on the visual environment.

#### 4.14.3 Cumulative Impacts

Given the oil and gas industry development that has occurred in this area over the years, and the fact that the Osprey Platform is currently in place, conversion to production operations is not expected to contribute significantly to cumulative impacts on the visual environment.

#### 4.14.4 Mitigation Measures

No specific mitigation measures have been identified for visual impacts. Mitigation measures presented previously to minimize the probability and consequences of a major oil spill would also be applicable to mitigate visual impacts.

### 4.15 RECREATION IMPACTS

#### 4.15.1 Impacts of the Proposed Project

Recreational impacts may occur due to oil spills, increased population and industrial employment growth, and changes in the aesthetic characteristics of the landscape. The most severe impacts to recreation would be primarily associated with a major oil spill. The east side of Cook Inlet and offshore areas, particularly in the lower inlet, are heavily used by local and regional residents and non-resident tourists for recreational purposes. The west side receives less use, and this primarily occurs from local residents for subsistence activities. A major oil spill in the upper inlet potentially could result in a variety of impacts including:

- Locally heavy oiling of beaches used for clamming, beachcombing, and fishing.
- Real or perceived tainting of recreational fishing and waterfowl hunting areas and stocks.
- Restricted use of offshore recreational and tourist-related vessels due to the presence of oil on the water surface.

Loss of recreational values for coastal and offshore areas are expected to generally be short-term. On heavily impacted beaches, visible oiling may be present for one year, or longer in more sheltered areas. Even the perception of oiling could deter the use of beaches for several years after a major spill event. While locally these effects might be significant from a major spill, they would generally be short-term. In the absence of a spill, impacts are considered to be negligible. A major oil spill is not expected to occur during the life of the project (see Section 4.1.4).

### 4.15.2 Impacts of Alternatives

Impacts on recreation of Alternative 2 (offshore pipeline to Kustatan) and 3 (offshore pipeline to Trading Bay) would be comparable to the proposed project. The alternatives include longer underwater pipelines and therefore would have a slightly higher probability of an oil spill. Alternative 4 (no action) would have no impacts on recreation.

### 4.15.3 Cumulative Impacts

Oil and gas industry development that has occurred in this area over the years, has not affected recreation use and opportunities to date. The proposed project is not expected to contribute significantly to adverse impacts on recreation.

### 4.15.4 Mitigation Measures

Applicable mitigation measures include those presented previously to minimize the probability and consequences of a major oil spill.

## 4.16 Cultural, Historical, and Archaeological Impacts

### 4.16.1 Impacts of the Proposed Project

Potential impacts on archaeological and cultural resources may occur from onshore activities associated with construction of the onshore pipeline/access road and the Kustatan Production Facility.

Lands adjacent to the proposed Kustatan Production Facility location are known to contain significant archaeological resources that will require protection. Forest Oil is working with the EPA and the SHPO to ensure that the State and Federal objectives with regards to these resources are met. This effort includes development of a Programatic Agreement which is provided in Appendix E.

In general, all known significant archaeological/cultural resource artifacts will be managed through consultion with the SHPO and EPA. Potential impacts could result from the inadvertent destruction of additional artifacts, which have not previously been identified and removed. Should additional artifacts be uncovered during the construction phase, appropriate actions would be determined through consultation with EPA and the SHPO and implemented.

Access to the area containing significant artifacts will be increased by construction of an access road through a previously undisturbed area. Trespassers could potentially use the access road, which will not be secured, to conduct looting and other indiscriminate and damaging activities on known and unknown sites located on private land in the West Foreland area. However, the oil companies operating in the West Foreland area (Forest Oil and Unocal) control all access roads within the local road system; the roads are normally used only for oil industry operations. The potential for disturbance of archaeological resources by trespassers is considered to be minor but could result in permanent impacts.

### 4.16.2 Impact of Alternatives

Alternative 2 would have the same potential impacts on the cultural, historical, and archaeological resources as the proposed project. Alternative 3 would have negligible impacts as it does not include activities in the Kustatan area. Alternative 4 (no action) will not involve any construction activities and therefore would result in no impacts to cultural, historical, or archaeological resources.

### 4.16.3 Cumulative Impacts

Cumulative impacts of development could cause adverse impacts to the rich cultural and archaeological resources in the West Foreland area. However, no other development is planned for this area (NCG 2001) and except for the pipeline/access road and the Kustatan Production Facility, it will likely remain mostly undisturbed. Therefore, cumulative impacts from the proposed project on cultural, historical, and archaeological resources are expected to be minor.

### 4.16.4 Mitigation Measures

The proposed project has been configured to avoid locations of archaeological resources. Forest Oil is working with EPA and the SHPO to ensure that the State and Federal objectives with regards to these resources are met. This effort includes development of a Programmatic Agreement; this agreement is provided in Appendix E.

The Programmatic Agreement specifies procedures for mitigating potential impacts on cultural resources associated with construction of structures, roads, pipelines, drill pads, material sources, or other activities that significantly disturb the ground surface or have other effect on historic properties. Major provisions of the draft Programmatic Agreement include:

- A meeting between EPA, SHPO, Forest Oil and other interested parties will be held in Anchorage each year to discuss the previous year's activities and activities scheduled for the upcoming year.
- Annual staff training of project managers will be conducted on the procedures regarding the identification of historic properties and cultural resources, including identification, discovery, and notification procedures when archaeological materials, human remains, or historic buildings or structures are encountered. Training will be conducted by Forest Oil's project archaeoogist.
- A cultural resource briefing will be conducted for all field staff by the project archaeologist or trained field supervisors, with recurrent training when working in areas that may be culturally sensitive.
- All archaeological and historical work will be conducted by an archaeologist, historian, architectural historian, and/or historical architect, meeting the appropriate qualifications as specified in Appendix E.

- Forest Oil must consult with EPA and SHPO in any area where activities are to take place and have not been previously examined, or where EPA and SHPO have determined the need for more extensive examination. Activities include but are not limited to construction of structures, roads, pipelines, drill pads, material sources, or other ground-disturbing activities.
- Efforts must be made by Forest Oil to identify historic properties in those areas where activities could affect historic properties, including background research, consultation, oral history interviews, and appropriate field investigations (under the supervision of the project archaeologist).
- All discoveries of archaeological or historical materials or properties will be documented by Forest Oil, and submitted to EPA and SHPO for review and consultation within three working days of discovery.
- Archaeological monitoring (under supervision of the project archaeologist) will be conducted during ground-disturbing activities; monitoring results will be submitted to EPA and SHPO.
- Archaeological and historical sites will be avoided to the extent possible. If disturbance is unavoidable, Forest Oil's project archaeologist will consult with EPA, SHPO, and other signatories of the PA as applicable within three working days of the discovery to identify actions necessary to make a Determination of Eligibility to the National Register of Historic Places and then carry out the actions.
- If a possible historic building, structure, or parts thereof are discovered in the area of potential effect, EPA and SHPO will be consulted; if EPA finds that the building or structure is eligible for inclusion on the National Register of Historic Places, EPA will make an assessment of adverse effect. If necessary, EPA will direct Forest Oil to develop a plan to lessen the adverse impact. Forest Oil will e required to obtain written authorization from EPA to continue work in the area of the structure.
- Forest Oil will ensure that no activity will knowingly disturb human burials or human remains, including fragmentary or isolated human remains. If human remains are inadvertently discovered during the course of activities, all activities will cease until the project archaeologist, in consultation with EPA, SHPO, and the Alaska State Medical Examiner, can investigate. The SHPO will be notified immediately. Treatment of Native-American remains is detailed in Appendix E.

Forest Oil also has policies in place that provide for strong disciplinary actions against disturbances to or removal of cultural resources (NCG 2001).

Through avoidance of these resources and proper mitigation, as detailed in the Programmatic Agreement, potential adverse impacts on cultural, historical, and archaeological resources are expected to be minor to moderate for the proposed project.

## 4.17 UNAVOIDABLE ADVERSE IMPACTS

This section describes unavoidable adverse impacts that are likely to be caused by the proposed project.

### 4.17.1 Soil/Sediment

Construction of the offshore and nearshore pipelines will result in unavoidable adverse impacts to soils/sediment due to disturbance of the seafloor during pipelaying operations, particularly if the pipe lay barge methods is used for the underwater portion of the pipeline. Seafloor disturbance of 12 to 480 acres will occur, depending on the pipelaying method used. Trenching through the shallow intertidal/subtidal area will also result in sediment disturbance, although the total area or volume disturbed is not known. Construction impacts are expected to be very short-term.

Onshore terrain disturbances will result from construction of the access road and pipeline through 1.8 miles of undisturbed area from the West Foreland to the location of the Kustatan Production Facility, and will adversely impact wetlands and terrestrial habitat in the area. Some terrain disturbance will also result from construction of the Kustatan Production Facility. Because construction of the proposed project affects only a small portion of undisturbed terrain, adverse impacts are expected to be minor.

### 4.17.2 Air Quality

Increased air emissions will result from construction and normal operations of the proposed project. However, emissions are not predicted to exceed 250 tons per year and therefore are not likely to result in significant adverse impacts.

### 4.17.3 Marine Water Quality

Unavoidable adverse impacts on water quality will occur as a result of construction activities (e.g., pipeline placement), primarily in the form of increased suspended sediment concentrations. Calculations indicate that suspended sediment concentrations at a downcurrent distance of 1,000 feet will be less than 50 mg/L; near the Forelands, suspended sediment concentrations of 100 to 200 mg/L are common. Construction impacts on water quality are considered short-term and very localized.

Permitted discharges from the Osprey Platform will meet all applicable water quality standards and are not expected to result in unavoidable adverse effects on marine water quality.

Oil spills during the life of the proposed project are likely to have adverse effects on marine water quality. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely. Based on average industry oil spill rates, 6 to 12 spills less than 50 barrels in size (with an average spill size of 5 barrels) would be expected to occur over an assumed 30-year project life. Moderately large spills (50 to 1,000 barrels) have a relatively high probability of occurrence. These oil spills could have significant effects on water quality; effects are expected to be short-term, however (e.g., less than 3 years).

### 4.17.4 Freshwater Resources

Unavoidable impacts on freshwater resources are related to the potential for an onshore oil spill from the the production facility or onshore pipelines. Private freshwater use of shallow groundwater may occur in the area, probably on a seasonal basis. Oil spills could adversely impact these resources. In addition, oil spills would adversely impact wetlands and wetland habitat.

### 4.17.5 Marine Biological Resources

Unavoidable adverse impacts on marine biological resources will occur as a result of disturbance and noise during construction, and oil spills. Construction will result in seafloor disturbance and thereby adversely impact benthic communities. Because benthic communities are fairly sparse in the project area (due to the highly energetic nature of the seafloor sediments), adverse impacts are expected to be short-term and minor. Noise and increased air traffic during construction will adversely impact local bird populations, however these impacts are avoidable if appropriate mitigation measures are in place. Porpoises, killer whales, and seals may exhibit temporary behavioral reactions to construction activities.

Oil spills during the life of the proposed project are likely to have adverse effects on marine biological resources. The magnitude of these effects depends on the size, location, timing, and behavior of a spill. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely. Adverse impacts to benthic organisms, fish, marine birds, and mammals from an oil spill could be minor to significant, with potentially long-term consequences. Of particular concern are potential adverse effects on migrating birds.

### 4.17.6 Threatened and Endangered Species

Unavoidable adverse impacts to threatened, endangered, and depleted species are likely to occur from noise and general disturbance associated with construction activities, and oil spills. Construction activities could increase stress on the declining population of beluga whales in Cook Inlet, further reducing fitness and survivorship. These impacts are likely to be short-term and localized, however.

Oil spills during the life of the proposed project are likely to have adverse effects on threatened, endangered, and depleted species. The magnitude of these effects depends on the size, location, timing, and behavior of a spill. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely. Adverse impacts to individual Steller sea lions may occur, but the proposed project is not likely to adversely affect Steller sea lion populations or critical habitat. The beluga whale lives in Cook Inlet year-round, and may be particularly sensitive to environmental stress due to the low level and declining state of the population. Potential adverse impacts to belugas include death due to ingestion of spilled oil or oil-contaminated prey, inhalation of hydrocarbon vapors, skin and/or sensory organ damage, and reduced prey availability. In addition, displacement of belugas due to an oil spill could prevent access to important habitat areas where they feed. Any reduction in survivorship could be detrimental to the population.

### 4.17.7 Terrestrial Biological Resources

Unavoidable impacts on wetlands would occur as a result of construction of the onshore pipeline/access road in the West Foreland area. Approximately 772 lineal feet of wetland will be crossed by the proposed access road; about 360 feet of wetlands crossing can be avoided by rerouting the access road slightly to the north. Noise and general disturbance associated with onshore clearing and construction will impact terrestrial birds unless activities are conducted outside nesting periods. Minor and short-term construction impacts to terrestrial mammals will also likely occur, as well as displacement of a small number of animals due to habitat alteration associated with construction of the onshore production facility.

Onshore oil spills would adversely impact terrestrial biota. The magnitude of these effects depends on the size, location, timing, and behavior of a spill. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely. Impacts of a major oil spill on bears, river otters, and other mammals include increased mortality and habitat loss/contamination, but effects would be short-term and would be unlikely to affect regional populations. Birds could take up to three generations to recover from a major oil spill; oil spill impacts would be most severe during the summer when waterfowl are abundant in the area.

#### 4.17.8 Socioeconomic Impacts

Unavoidable socioeconomic impacts would occur as a result of a major oil spill from the proposed project. In particular, potential economic losses to the commercial fishing industry due to fishing closure, real and perceived fish tainting, and oiling of gear could be significant. Impacts would likely be short-term. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely, and would have negligible to minor adverse socioeconomic impacts.

#### 4.17.9 Subsistence Harvesting

Unavoidable impacts on subsistence harvesting would occur as a result of a major oil spill from the proposed project. In particular, subsistence harvesters in the community of Tyonek would be most likely to be impacted due to the potential loss of access to key subsistence food items and subsistence habitats including fish, clams, beluga whales, and ducks and geese. Impacts would likely be short-term. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely, and would have negligible to minor adverse socioeconomic impacts.

#### 4.17.10 Visual Environment/Aesthetics

The Osprey Platform will be visible over a wide area of central and upper Cook Inlet, and therefore will result in minor and long-term adverse impacts to the visual environment. In the event of a major oil spill, adverse visual environment impacts to highly-oiled beaches would occur. This impact would be short-term.

#### 4.17.11 Recreation

Unavoidable impacts to recreational resources would occur as a result of a major oil spill from the proposed project. Adverse impacts include: locally heavy oiling of beaches used for clamming, beachcombing, and fishing; real or perceived tainting of recreational fishing and hunting areas and stocks; and restricted use of offshore recreational and tourist-related vessels due to the presence of oil on the water surface. Recreational impacts are expected to be short-term and localized. Although a major spill is not expected to occur during the life of the project, smaller spills are considered likely, and would result in minor adverse impacts.

#### 4.17.12 Cultural, Historical, and Archaeological Resources

Unavoidable impacts on archaeological and cultural resources are not expected to occur as a result of the proposed project because a Programmatic Agreement has been developed in coordination with the State Historic Preservation Officer (SHPO) and EPA to ensure that State and Federal objectives with regard to these resources are met. A Programmatic Agreement is attached to this EA as Appendix E.

### 4.18 SHORT-TERM USE VS. LONG-TERM PRODUCTIVITY

NEPA regulations (Section 1502.16) call for a comparison between the short-term effects from the uses of man's environment to long-term effects including the maintenance and enhancement of long-term productivity.

The proposed project as described in Section 2.2 involves the drilling and operation of wells for production of oil, natural gas and natural gas liquids; installation and operation of oil and natural gas processing equipment on-board the Osprey Platform; construction and operation of an onshore production facility; and construction and operation of underwater and onshore pipelines to transport oil and natural gas from the platform to the production facility. The estimated project life is 20 to 30 years.

Economic, political, and social benefits would accrue from the availability of oil, helping to decrease the nation's dependence on oil imports. There would be direct and indirect benefits to local employment and local and state government tax and royalty revenues during the production phase. See Section 4.10.2 for a detailed discussion of tax revenue and employment benefits.

Many of the effects discussed in Section 4 are considered to be short-term (e.g., during construction and early operation phases), and can be reduced by the use of mitigating measures. Potential long-term impacts on productivity (e.g., impacts that will continue after the project is complete) are summarized below.

***Destruction of Wetlands.*** The construction of onshore pipelines would result in impacts to approximately 26 acres of undisturbed area for construction of the access road and 3 acres of land for construction of the access ramp through the bluff. Although these impacts are permanent, they represent less than 0.2 percent of the West Foreland area. Four wetland areas totaling approximately 772 lineal feet of wetland crossings would be impacted by construction (or about 2.2 acres of wetlands). This is a permanent loss, however it is a relatively small area of the wetlands. Wetland mitigation and restoration activities would be specified and implemented under a Corps of Engineers 404 permit.

***Damage to Artifacts.*** Archaeological and historic finds discovered during project construction would enhance long-term knowledge; any destruction of artifacts, however, would represent long-term losses.

***Impacts on Biological Productivity from Oil Spills.*** The operation of the project could present long-term risks through the exposure of offshore and onshore environments to oil spills and/or pipeline related accidents and spills. The degree to which these risks could impact and affect various resources and the health, population levels and potentially the viability of certain species is discussed below. An estimated 25,000 barrels per day of oil and produced water will be transported via pipeline from the platform to the shore. Leak detection and SCADA systems and regular maintenance and inspection as well as spill prevention and contingency plans reviewed and approved by ADEC, U.S. Coast Guard and MMS should reduce the risks associated with a spill or pipeline leak or rupture.

An oil well blowout or pipeline rupture from the Osprey Platform or onshore pipeline rupture could result in long-term impacts on productivity and population viability to the following biological resources:

- Benthic communities could be impacted long-term in areas where oil is retained in sediment and persists for years. Also, the negative impacts of oil contamination on benthic invertebrates could indirectly impact higher trophic level species such as fish and birds, especially shorebirds that feed on benthic invertebrates.
- Sublethal effects to anadromous fish populations such as salmon would be long-term as petroleum hydrocarbons can reduce the homing ability of salmon (Babcock 1985).
- Oil spills are likely to negatively impact marine bird species. A large spill in an area of high bird concentrations could affect thousands of birds, causing high mortality, with full recovery taking up to three generations. The effects of contamination of prey organisms or other food sources can be long-term and result in reduction of reproductive capabilities of predator species (Patten 1993). Recovery for predator species can be lengthy and last for a number of years.
- Non-endangered baleen whales could be negatively affected for some time from an oil spill depending on the time of year, duration and quantity of spill. Movement of oil into lower Cook

Inlet or Shelikof Strait could affect a large number of individuals, including impacts on feeding during migration.

- Although not normally present in the project area, Stellar sea lions inhabit some areas in the Lower Cook Inlet and some can occur in the upper inlet. If a rookery was contaminated with oil, the current rate of population decline could accelerate significantly (Calkins et al. 1994).
- The beluga whale is the only year-round resident marine mammal in the upper Cook Inlet. Oil spills could be fatal to individuals through direct contact or reduction in prey. Displacement caused by oil spills and clean-ups could prevent access to important habitat areas where they feed. Any reduction in survivorship could be detrimental to the population.

## 4.19 Irreversible and Irretrievable Commitments of Resources

NEPA Regulations (Section 1502.16(f)) require identification of natural or depletable resource requirements and conservation potential. Oil resources in the Redoubt Shoal Unit would be irretrievably consumed under the proposed project.

### 4.19.1 Irretrievable Commitment of Resources

The Osprey Platform is a movable drilling platform that is already in place to support exploration drilling operations. The platform would be used to support offshore production operations. Conversion of the platform will require a limited amount of production equipment. No new construction would be associated with the platform. Because the platform is moveable and reusable there is no associated irreversible or irretrievable commitment of resources.

Onshore production facility and pipeline construction would require an irretrievable commitment of natural resources from direct consumption of fossil fuels, construction materials, the manufacture of new equipment that largely cannot be recycled at the end of the project's useful life, and energy for the production of materials. Furthermore, construction and clearing of the pipeline right-of-way and site of the production facility would necessitate vegetation and habitat removal, which could affect wildlife species in the region to a minor extent . Proper restoration and revegetation of the pipeline corridor would reduce long-term impacts.

Use of large volumes of groundwater (up to 800,000 gallons per day initially) from depths of 12,000 feet results in a long-term (and essentially irretrievable) commitment of water resources. While recharge of deep groundwater may eventually occur, it will likely take many years for the aquifer to fully recharge.

During the operational phase of the pipeline and production facility, the project would allow for the transport of additional nonrenewable resources, i.e. oil and gas, although the project itself would not utilize significant amounts of nonrenewable natural resources. The production facility and pipeline do not commit future use of petroleum products, instead they facilitate the movement and processing of the resource.

### 4.19.2 Irreversible Damage

With regard to irreversible damage, the potential exists for an accident associated with an oil spill or rupture of the pipelines. A spill or accidental pipeline rupture could result in adverse impacts on various environmental resources. Resource impacts could include loss or damage to sensitive marine and terrestrial biological resources and contamination of Cook Inlet and onshore surface waters and wetlands, with the potential to damage cultural resources. The potential risk and consequences of an oil spill or pipeline accident are mitigable to some degree with the implementation of mitigation and safety measures, equipment, and emergency response plans outlined in this EA. The risk cannot be completely eliminated, thus the potential for irreversible damage remains.

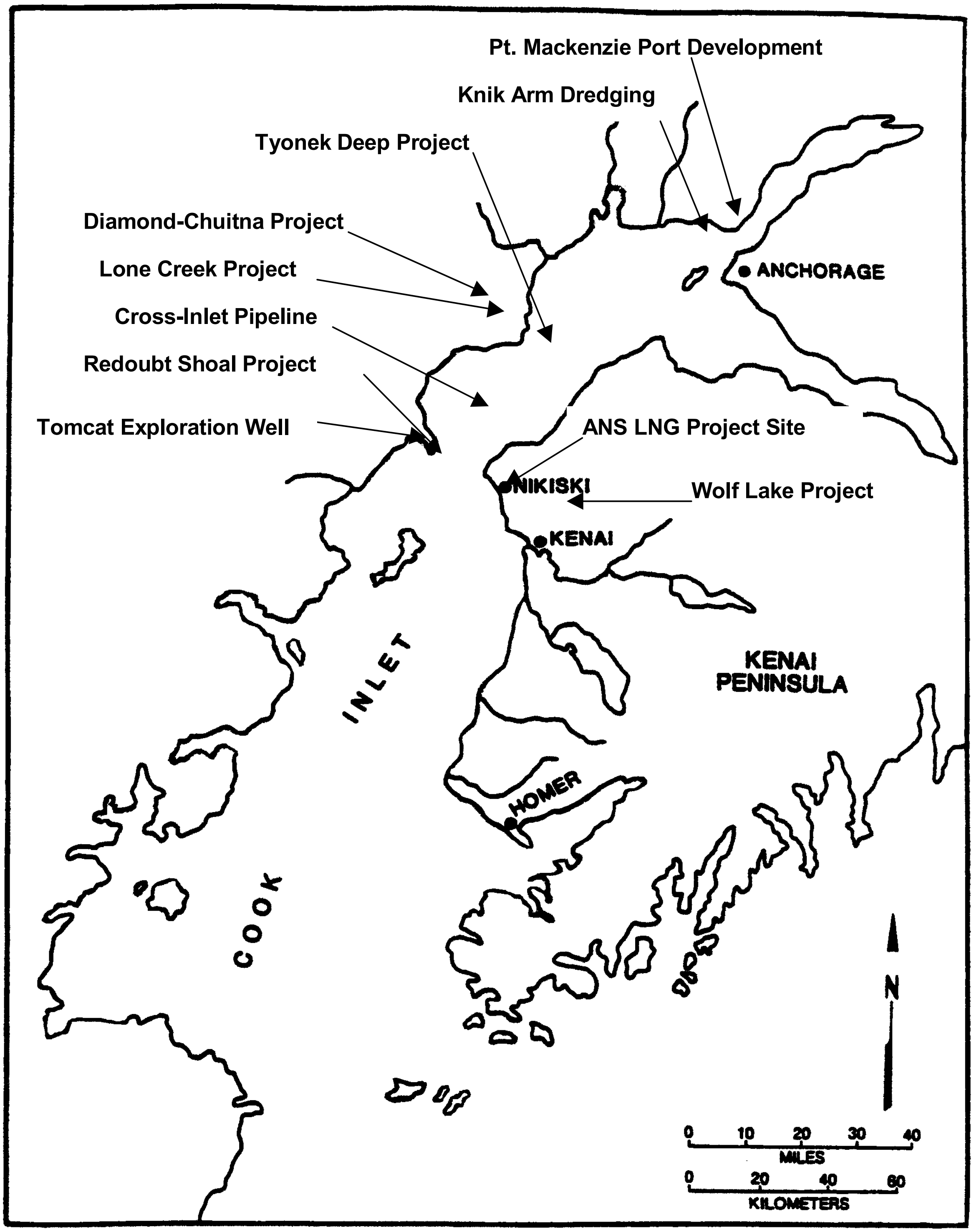



**Figure 4-1. Locations of Planned and Potential Projects in Cook Inlet**

## Table 4-1
## Summary of Potential Major Spill Sources and Proposed Mitigation Measures

| Spill Source | Volume and Product | Major Mitigation Measures |
|---|---|---|
| ***Osprey Platform*** | | |
| Diesel Tank Rupture | 20,000 gallons diesel fuel | overfill protection; secondary containment |
| Well Blowout | 5,500 barrels/day crude oil (1) | drilling mud weight; blowout preventers |
| ***Kustatan Production Facility*** | | |
| Oil Tank Rupture | 25,000 barrels crude oil | SCADA monitoring/control system; overfill protection; secondary containment |
| Produced Water Tank Rupture | 5,000 barrels produced water | SCADA monitoring/control system; overfill protection; secondary containment |
| ***Pipelines*** | | |
| Underwater Pipeline | 1,633 barrels crude oil (2) | SCADA monitoring/control system; internal/external monitoring |
| Onshore Pipeline | 1,633 barrels crude oil (2) | SCADA monitoring/control system; internal/external monitoring |

(1) Regulatory/response planning standard set by ADEC

(2) Equal to line volume plus one hour of flow and ignoring topographic limitations/trapping (i.e., worst case)

Source: NCG 2001

## Table 4-2
## Oil Spill Potential for the Redoubt Shoal Unit

| Spill Size (barrels) | Spill Rate (spills/Bbbl) | Average Spill Size (Barrels) | Predicted Number of Spills During Project Life: Total Production 25 Million Barrels | Predicted Number of Spills During Project Life: Total Production 50 Million Barrels |
|---|---|---|---|---|
| 1 to <50 | 234 | 5 | 5.9 | 11.7 |
| 50 to <1,000 | 9.8 | 160 | 0.25 | 0.49 |
| >1,000 (Platform) | 0.6 | 50,000 | 0.015 | 0.03 |
| >1,000 (Pipeline) | 0.67 | 10,500 | 0.017 | 0.034 |

Bbbl = billion barrels
Sources: NCG 2001, MMS 1995

## Table 4-3
## Summary of Other Potential Projects In Cook Inlet

| Project Name/Location | Description/Project Components |
|---|---|
| Forest Oil<br>Tomcat Exploration Well<br>West Cook Inlet | The project included exploration drilling in the Kustatan area. An access road from the West Forelands #1 site to Kustatan was constructed and the well drilled in the fall of 2000. Commercial quantities of hydrocarbons were not found, and this project will not proceed as a production project. |
| UNOCAL, et al.<br>Cross-Inlet Oil Pipeline<br>Upper Cook Inlet | The project would include construction of an oil pipeline from the Granite Point area on the west side of the inlet to the Nikishka Bay area on the east side of the inlet. The primary objective of the pipeline would be to transfer existing oil production from the Drift River Terminal (which would be then put in “warm” shutdown) directly to the Nikiski area. The project is currently in conceptual phase and permitting could be initiated if it is determined to be economically viable. Currently the project is believed to have a low probability of proceeding. |
| ARCO Alaska, Inc. et al.<br>Alaska North Slope LNG Project<br>Southcentral Alaska | The project includes a 28 to 30-inch natural gas pipeline from the Alaska North Slope with gas liquefaction facility at tidewater and associated marine transportation. Project is in the planning stage with potential marine sites at Nikiski in the Cook Inlet area and at Anderson Bay in the Prince William Sound area. The project is still in the preliminary evaluation stages and would likely not be constructed until 2007 or later. |
| Marathon Oil Company<br>Wolf Lake Project<br>Kenai Peninsula | The project is an onshore gas production operation northeast of Kenai on the east side of Cook Inlet. Project is currently in the permitting stage and is planned to come in operation in 2000/2001 timeframe. |
| Phillips Petroleum Co.<br>Tyonek Deep Project<br>Upper Cook Inlet | The project would include addition of oil production equipment to an existing gas platform in the inlet and construction of about 17 miles of onshore/underwater pipelines to transport crude oil and natural gas to the Granite Point area. Permitting was initiated in 1998 but was recently suspended due to project economics. |
| Anadarko and Phillips<br>Lone Creek Project<br>West Cook Inlet | The project would include development of an onshore gas prospect in the general Chuitna River area on the west side of the inlet. The project would require a gas pipeline possibly to the Granite Point area. The resource was identified in 1998 and could be developed by Phillips Petroleum Company possibly as early as 2003 if determined to be economic. |

**Table 4-3 (Continued)**
**Summary of Other Potential Projects In Cook Inlet**

| Project Name/Location | Description/Project Components |
|---|---|
| DRven Corporation<br>Diamond Chuitna Coal Project<br>West Cook Inlet | The project would include development of an onshore open pit coal mine, transportation systems to tidewater and a marine port site in the general Tyonek area. The project was permitted in the 1980s. The project is still active but currently on hold pending a market for the coal. It is not believed that the project will proceed in the immediate future. |
| Tyonek Native Corporation<br>Tyonek Industrial Park<br>West Cook Inlet | The Tyonek Native Corporation has been actively promoting developing and industrial park on the west side of the inlet near Tyonek. Various potential industrial operations have been pursued including an iron reduction plant, but specific commitments have not been developed. |
| Corps of Engineers<br>Knik Arm Dredging Project<br>Upper Cook Inlet | The multi-year project includes deepening of a vessel navigation channel into the Port of Anchorage. Dredging operations are currently underway and should continue through the summer of 2000. |
| Matanuska Susitna Borough<br>Point Mackenzie Port<br>Upper Cook Inlet | The project includes construction of a small vessel dock in the Point Mackenzie area of upper Cook Inlet. The project has been constructed, but there has been no major associated developments or operations identified to date. |

Source: NCG 2001

**Table 4-4**
**Preliminary Emissions Inventory for the Redoubt Shoal Unit**

| **Equipment** | **$NO_x$ (tpy)** | **CO (tpy)** | **$PM_{10}$ (tpy)** | **VOC (tpy)** | **$SO_2$ (tpy)** |
|---|---|---|---|---|---|
| *Onshore Production Facility*[1] | | | | | |
| Turbine Generators | 135.0 | 97.2 | 5.4 | 38.7 | 1.5 |
| Crude Heaters | 27.2 | 23.2 | 2.4 | 1.6 | 0.0 |
| Fire Water Pump | 0.6 | 0.1 | 0.0 | 0.1 | 0.0 |
| Process Flare | 0.2 | 1.3 | 0.1 | 0.7 | 0.0 |
| Glycol Reboiler | 0.3 | 0.2 | 0.0 | 0.0 | 0.0 |
| Glycol Still Vent | 0.0 | 0.0 | 0.0 | 36.1 | 0.0 |
| Process Fugitives | 0.0 | 0.0 | 0.0 | 30.9 | 0.0 |
| Crude Tanks | 0.0 | 0.0 | 0.0 | 61.5 | 0.0 |
| Slop Oil Tank | 0.0 | 0.0 | 0.0 | 3.7 | 0.0 |
| Small Space Heaters | 1.6 | 1.4 | 0.1 | 0.1 | 0.0 |
| Total | 165.0 | 123.1 | 7.7 | 173.2 | 1.7 |
| *Offshore Platform--Drilling Equipment*[2] | | | | | |
| Clayton ROG-100 Boiler No. 1 | 2.9 | 0.7 | 0.3 | 0.04 | 5.0 |
| Clayton ROG-100 Boiler No. 2 | 2.9 | 0.7 | 0.3 | 0.04 | 5.0 |
| Parker GO 4032 No. 1 | 2.1 | 0.5 | 0.2 | 0.03 | 3.6 |
| Parker GO 4032 No. 2 | 2.1 | 0.5 | 0.2 | 0.03 | 3.6 |
| Caterpillar D399 Engine Nos. 1 thru 5 and D379 Engine | 1.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| Caterpillar 3412 Engine Nos. 1, 2 | 2.7 | 2.3 | 0.4 | 0.2 | 0.4 |
| Waukeska F-1197DSU Engine | 0.2 | 0.03 | 0.01 | 0.01 | 0.01 |
| Caterpillar 3406 Engine Nos. 1, 2 | 9.6 | 6.1 | 1.1 | 0.7 | 1.2 |
| Test Flare | 9.3 | 50.5 | 3.6 | 8.6 | 0.5 |
| Total | 33.0 | 61.5 | 6.2 | 9.8 | 19.4 |

Sources:
1 HCG 2001a
2 HCG 2001b

## Table 4-5
## Increased Suspended Sediment Concentrations During Pipelaying Operations

| Downcurrent Distance (feet) | Plume Area (sq. ft.) | Suspended Sediment Concentration (mg/L) | | | |
|---|---|---|---|---|---|
| | | 1-knot current | 2-knot current | 3-knot current | 4-knot current |
| 100 | 1,010 | 135 | 67 | 45 | 34 |
| 500 | 2,050 | 66 | 33 | 22 | 17 |
| 1,000 | 3,330 | 41 | 20 | 14 | 10 |
| 5,000 | 13,700 | 10 | 5 | 3 | 2 |

Source: NCG 2001

## Table 4-6
## Summary of Proposed Discharges from the Osprey Platform

| Effluent | Volume of Discharge | Frequency of Discharge | Parameter | Maximum Daily Level | Average Daily Level |
|---|---|---|---|---|---|
| Deck Drainage | 108,000 gallons/day | daily | Temperature | <70ºF | <60ºF |
| Domestic Wastes | 4,000 gallons/day | daily | Oil & Grease | No Sheen | No Sheen |
| Boiler Blowdown | 100 gallons/event | weekly | | | |
| Fire Control Test Water | 22,500 gallons/event | monthly | | | |
| Non-Contact Cooling Water | 300,000 gpd | daily | | | |
| Sanitary Wastes | 2,020 gpd | daily | BOD | 60 mg/L | <60 mg/L |
| | | | TSS | 60 mg/L | <60 mg/L |
| | | | Temperature | <70ºF | <60ºF |
| | | | Oil & Grease | No Sheen | No Sheen |
| | | | Total Chlorine | >1 ppm | >1 ppm |
| Excess Cement Slurry | 4,200 gallons/event | 30 events/year | TSS | <200,000 mg/L | <100,000 mg/L |
| | | | Temperature | <80ºF | <60ºF |
| | | | pH | <12 | <9 |
| | | | Oil & Grease | No Sheen | No Sheen |

Source: NPDES Permit Application, submitted to EPA on 2/29/2000 (Appendix A)

# APPENDIX A

# NPDES PERMIT APPLICATION

Removed Drilling Muds

# Forcenergy Inc

## Alaska Division

February 29, 2000

Christine Cook
U.S. Environmental Protection Agency
Region X
1200 6th Avenue
Seattle, WA 98101

Dear Christine:

Re: Proposed Redoubt Shoal Production Operations, Southcentral Alaska

Attached is our revised NPDES Permit Application for your review. We have eliminated the previous proposed discharges of drilling muds and cuttings from this application.

Sincerely,

John Amundsen
Safety, Health and Environment Manager

Date Modified: 2/29/00
Date Prepared: 2/29/00
jda

\\FGEANCH\VOL1\ACCT\JAmundsen\Redoubt Shoals\EPA\Response to comments letter.doc (fill–in areas are spaced for elite type, i.e., 12 characters/inch).

FORM 1 GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

# GENERAL INFORMATION

*Consolidated Permits Program*

*(Read the "General Instructions" before starting.)*

**I. EPA I.D. NUMBER**

F D

**LABEL ITEMS**

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

**GENERAL INSTRUCTIONS**

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill–in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill–in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

## II. POLLUTANT CHARACTERISTICS

**INSTRUCTIONS:** Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

| SPECIFIC QUESTIONS | YES | NO | FORM ATTACHED | SPECIFIC QUESTIONS | YES | NO | FORM ATTACHED |
|---|---|---|---|---|---|---|---|
| A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A) | | X | | B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B) | | X | |
| C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C) | | X | | D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D) | X | | X |
| E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3) | | X | | F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4) | | X | |
| G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4) | X | | NA | H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) | X | | NA |
| I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | | J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | |

## III. NAME OF FACILITY

1 SKIP Osprey Production Platform

## IV. FACILITY CONTACT

| A. NAME & TITLE *(last, first, & title)* | B. PHONE *(area code & no.)* |
|---|---|
| 2 Amundsen, John–HES Mgr. | 907 258 8600 |

## V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 310 K St., Suite 700

| B. CITY OR TOWN | C. STATE | D. ZIP CODE |
|---|---|---|
| 4 Anchorage | AK | 99501 |

## VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 West Forelands Area

B. COUNTY NAME

Kenai Peninsula Borough

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE *(if known)* |
|---|---|---|---|
| 6 Cook Inlet | AK | | |

CONTINUED FROM THE FRONT

**VII. SIC CODES (4-digit, in order of priority)**

| A. FIRST | | B. SECOND | |
|---|---|---|---|
| 7 1300 | (specify) Oil and Gas Extraction | 7 | (specify) |

| C. THIRD | | D. FOURTH | |
|---|---|---|---|
| 7 | (specify) | 7 | (specify) |

**VIII. OPERATOR INFORMATION**

A. NAME: 8 Forcenergy Inc

B. Is the name listed in Item VIII-A also the owner? ☒ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

P (specify) Oil/gas Company

D. PHONE (area code & no.): A 907 258 8600

E. STREET OR P.O. BOX: 310 K St., Suite 700

| F. CITY OR TOWN | G. STATE | H. ZIP CODE |
|---|---|---|
| B Anchorage | AK | 99501 |

**IX. INDIAN LAND**

Is the facility located on Indian lands? ☐ YES ☒ NO

**X. EXISTING ENVIRONMENTAL PERMITS**

| A. NPDES (Discharges to Surface Water) | D. PSD (Air Emissions from Proposed Sources) |
|---|---|
| 9 N NA | 9 P NA |

| B. UIC (Underground Injection of Fluids) | E. OTHER (specify) | |
|---|---|---|
| 9 U NA | 9 | (specify) |

| C. RCRA (Hazardous Wastes) | E. OTHER (specify) | |
|---|---|---|
| 9 R NA | 9 | (specify) |

**XI. MAP**

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements. See Attached Environmental Information Document

**XII. NATURE OF BUSINESS (provide a brief description)**

The Redoubt Unit Development Program includes conversion of an offshore oil and gas exploration drilling unit to an oil and gas production platform. Associated facilities include onshore and offshore pipelines and an onshore production facility. Details of the proposed project are outlined in the attached Environmental Information Document (EID).

**XIII. CERTIFICATION (see instructions)**

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME & OFFICIAL TITLE (type or print) | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Gary Carlson, Vice President | Gary Carlson | 2/25/00 |

**COMMENTS FOR OFFICIAL USE ONLY**

C

EPA Form 3510-1 (8-90)

Form Approved OMB No. 2040-0086 Approval Expires 5/31/92

Please type or print in the unshaded areas only

EPA ID Number *(copy from Item 1 of Form 1)*

Form **2D** NPDES

# EPA New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

## I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water.

| Outfall Number *(list)* | Latitude Deg | Latitude Min | Latitude Sec | Longitude Deg | Longitude Min | Longitude Sec | Receiving Water *(name)* |
|---|---|---|---|---|---|---|---|
| All | 60 | 41 | 46 | 151 | 40 | 10 | Cook Inlet |
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## II. Discharge Date *(When do you expect to begin discharging?)*

June 2000

## III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

| Outfall Number | 1. Operations Contributing Flow *(list)* | 2. Average Flow *(include units)* | 3. Treatment *(Description or List Codes from Table 2D-1)* |
|---|---|---|---|
| 003 | Deck Drainage | 0.108 mgd | 1-H and 4-B |
| 004 | Sanitary Wastes | 0.00202 mgd | 3-A, 5-A and 4-B |
| 005 | Domestic Wastes | 0.004 mgd | 4-B |
| 008 | Boiler Blowdown | 0.0001 mgd | 1-H and 4-B |
| 009 | Fire Control System Test Water | 750 gpm | 4-A or 1-H and 4-B |
| 010 | Non-Contact Cooling Water | 0.3 mgd | 4-B |
| 013 | Excess Cement Slurry | 100 bbl/day | 4-B |
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B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures. **See Attachment A**

C. Except for storm runoff, leaks, or spills, will any of the discharges described in item III-A be intermittent or seasonal?

☒ Yes *(complete the following table)* ☐ No *(go to item IV)*

| Outfall Number | 1. Frequency | | 2. Flow | | |
|---|---|---|---|---|---|
| | a. Days Per Week *(specify average)* | b. Months Per Year *(specify average)* | a. Maximum Daily Flow Rate *(in mgd)* | b. Maximum Total Volume *(specify with units)* | c. Duration *(in days)* |
| 008 Boiler Blowdown[1] | 1 | 12 | 0.0001 mgd | 100 gal/event | 1 day/event |
| 009 Fire Control Water[2] | 1 | 12 | 0.023 mgd | 22,500 gal/event | 1 day/event Est. 12/yr |
| 013 Excess Cement[3] | 3 | 12 | 0.0042 mgd | 100 bbl/event | 1 day/event Est. 30/yr |

Notes:
[1] Not planned or likely but possible to occur intermittently.
[2] Assume ½ hour test of system on a monthly basis.
[3] Intermittent while drilling depending on drilling, casing, and testing program/problems. May be up to 100 bbl per event.

**IV. Production**

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

| Year | a. Quantity Per Day | b. Units of Measure | c. Operation, Product, Material, etc *(specify)* |
|---|---|---|---|
| NA | | | |
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| CONTINUED FROM THE FRONT | EPA ID Number *(copy from Item 1 of Form 1)* | Outfall Number 003/005/008/009/010 |
|---|---|---|

**V. Effluent Characteristics**

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

**General Instructions** *(See table 2D-2 for Pollutants)*
Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

| 1. Pollutant | 2. Maximum Daily Value *(include units)* | 3. Average Daily Value *(include units)* | 4. Source *(see instructions)* |
|---|---|---|---|
| Temperature | <70 °F | <60 °F | 4 |
| Oil and Grease | No Sheen | No Sheen | 4 |
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| CONTINUED FROM THE FRONT | EPA ID Number *(copy from Item 1 of Form 1)* | Outfall Number 004 |
|---|---|---|

**V. Effluent Characteristics**

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

**General Instructions** *(See table 2D-2 for Pollutants)*
Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

| 1. Pollutant | 2. Maximum Daily Value *(include units)* | 3. Average Daily Value *(include units)* | 4. Source *(see instructions)* |
|---|---|---|---|
| BOD | 60 mg/l | <60 mg/l | 4 |
| TSS | 60 mg/l | <60 mg/l | 4 |
| Temperature | <70 °F | <60 °F | 4 |
| Oil and Grease | No Sheen | No Sheen | 4 |
| Total Residual Chlorine | >1 ppm | >1 ppm | 4 |
| Fecal Coliform | | | |
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| CONTINUED FROM THE FRONT | EPA ID Number *(copy from Item 1 of Form 1)* | Outfall Number 013 |
|---|---|---|

**V. Effluent Characteristics**

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

**General Instructions** *(See table 2D-2 for Pollutants)*

Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

| 1. Pollutant | 2. Maximum Daily Value *(include units)* | 3. Average Daily Value *(include units)* | 4. Source *(see instructions)* |
|---|---|---|---|
| Total Suspended Solids | <200,000 mg/l | <100,000 mg/l | 4 |
| Temperature | <80°F | <60°F | 4 |
| pH | <12 | <9 | 4 |
| Oil and Grease | <50 ppm | <30 ppm | 4 |
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| CONTINUED FROM THE FRONT | EPA ID Number *(copy from Item 1 of Form 1)* | |
|---|---|---|

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

| 1. Pollutant | 2. Reason for Discharge |
|---|---|
| NA | |

**VI. Engineering Report on Wastewater Treatment**

A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below.

☒ Report Available ☐ No Report

B. Provide the name and location of any existing plant(s) which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

| Name | Location |
|---|---|
| Offshore oil and gas drilling and production platforms | Cook Inlet Area, Alaska |

EPA ID Number *(copy from item one of Form 1)*

**VII. Other Information** *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

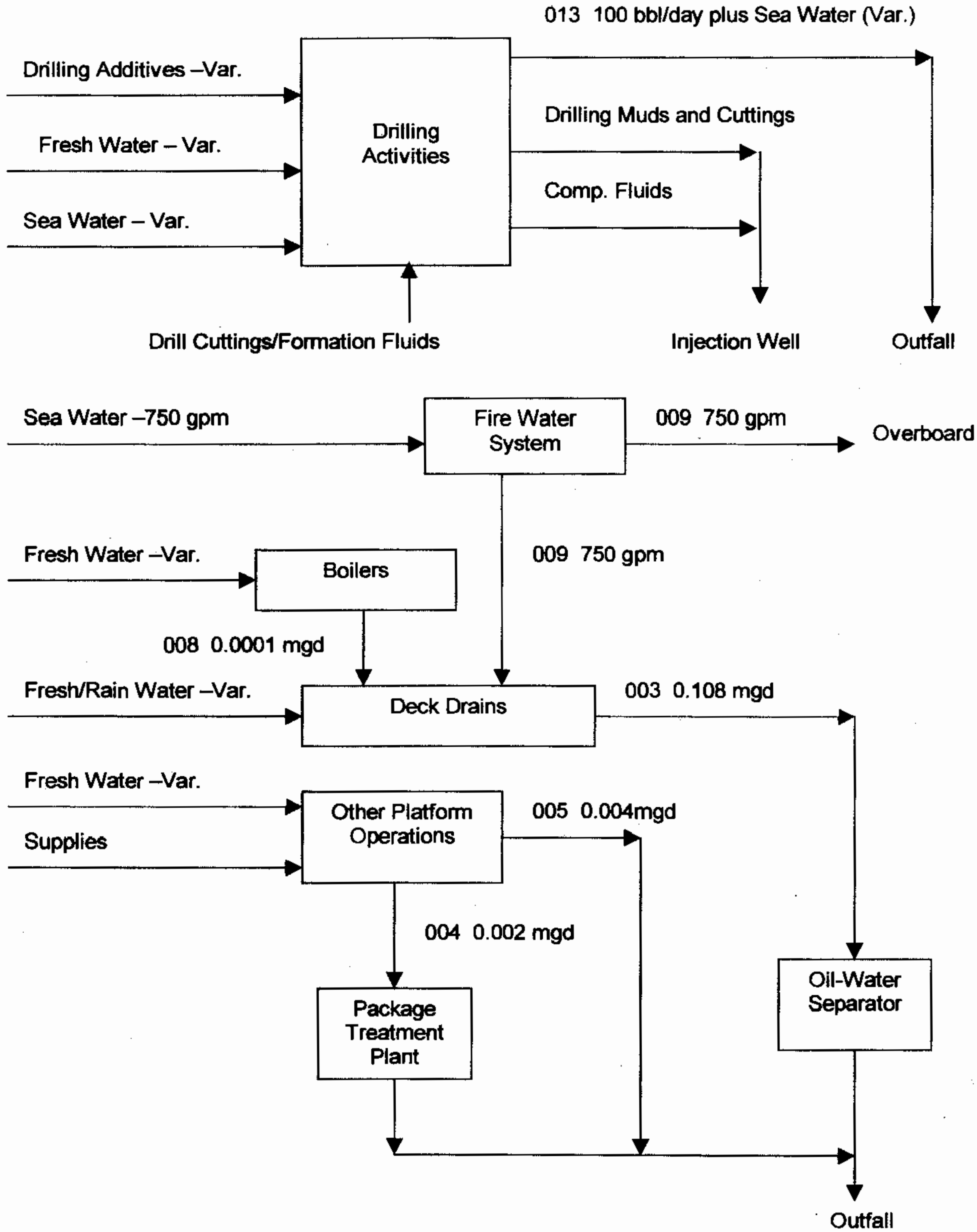
An Environmental Information Document for the Redoubt Unit Development Project is provided with this application.

**VIII. Certification**

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| A. Name and Official Title *(type or print)* | B. Phone No. |
|---|---|
| Gary Carlson, Vice President | (907) 258-8600 |
| **C. Signature** | **D. Date Signed** |
| Gary E Carlson | 2/25/00 |

## Attachment A
## Process/Discharge Overview



# APPENDIX B

# BIOLOGICAL ASSESSMENT

# Biological Assessment
# for Wastewater Discharges Associated with the Osprey Platform in the Redoubt Shoal Unit Development Project

## Cook Inlet, Alaska

Submitted to

Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Submitted by

Science Applications International Corporation
18706 North Creek Parkway, Suite 110
Bothell, Washington 98011

With

LGL Alaska Research Associates, Inc.
4175 Tudor Centre Drive, Suite 202
Anchorage, Alaska 99508

March 16, 2001

Contract No. 68-W7-0050, Delivery Order 2004
SAIC Project No. 06-5050-01-9695-003

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# 1.0 INTRODUCTION

The Clean Water Act, PL-92-500, as amended, authorizes the U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates discharges from point sources to waters of the United States. While the majority of states are currently authorized to administer the NPDES program, the State of Alaska is not among them. Thus, EPA regulates the point source discharges in the state by issuing NPDES permits.

Section 7 of the Endangered Species Act (ESA) requires federal agencies to conserve endangered and threatened species. It also requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) if they determine that any action they fund, authorize, or carry out may affect a listed species or designated critical habitat. A biological assessment (BA) is prepared to determine whether a project or action will have an effect on a listed or proposed species, and to determine whether informal or formal consultation with NMFS and/or USFWS is required.

Forest Oil (formerly Forcenergy Inc.) has proposed the development of a new oil and gas project in the waters of Cook Inlet, Alaska to access reserves in the Redoubt Shoal Unit. As a result of the development, Forest Oil is proposing to convert the offshore Osprey Platform from a manned exploratory platform to a production platform. Forest Oil has applied to EPA for an NPDES permit for the discharge of wastewater from the Osprey Platform in Cook Inlet, Alaska.

This document provides an assessment of the impacts of the wastewater discharge on threatened and endangered species of marine mammals and birds that may be present in or near the project area. These discharges include deck drainage, sanitary wastewater, and domestic wastewater (gray water).

The following sections provide a description of the proposed action, summarize the life history and status of the threatened and endangered species of marine mammals and birds potentially present in or near the project area, and assess potential impacts of wastewater discharges from the project on these species. This document is prepared and submitted in compliance with the formal consultation requirements of Section 7 of the ESA.

# 2.0 DESCRIPTION OF THE PROPOSED ACTION

The Osprey Platform, by design, is a movable drilling platform that has been constructed to support exploration and eventually production drilling operations for the Redoubt Shoal Unit (Figure 1). The platform was placed onsite during late June 2000, approximately 1.8 miles southeast of the end of the West Foreland (Latitude 60º 41’ 46” N, Longitude 151º 40’ 10” W) (Figure 2). The West Foreland is considered the northernmost boundary of lower Cook Inlet. The platform is approximately 12 miles northwest of Kenai, Alaska and approximately 70 miles southwest of Anchorage, Alaska. The water depth at the platform is approximately 45 feet (referenced to mean lower low water). The platform is designed to handle anticipated oceanographic, meteorological, and seismic conditions for the area.

At the completion of exploration drilling operations, which are currently being conducted under the General NPDES Permit for Oil and Gas Exploration (AKG285024), the Osprey Platform will be used to either support offshore production operations (as addressed in this document) or be removed if oil and gas are not found in commercial quantities. Platform conversion would include the addition of limited production equipment and the installation of offshore pipelines and utility lines.

If the platform is not converted to production, wells will be plugged and abandoned, the piling and conductors will be cut, and the platform floated off-location (similar to the manner in which it was floated on-location). These operations would be conducted in accordance with regulations and with appropriate approvals from the Alaska Oil and Gas Conservation Commission (AOGCC), the Alaska Department of Natural Resources (ADNR), and the Minerals Management Service (MMS).

## 2.1 PRODUCTION ACTIVITIES

### 2.1.1 Completion

After confirmation of a successfully producing formation, the well will be prepared for hydrocarbon extraction, or “completion.” The completion process includes: setting and cementing of the production casing; packing the well; and installing the production tubing. During the completion process, equipment is installed in the well that allows hydrocarbons to be extracted from the reservoir. Completion methods are determined based on the type of producing formation, such as hard or loose sand, and consist of four steps: wellbore flush, production tubing installation, casing perforation, and wellhead installation.

### 2.1.2 Fluid Extraction

The fluid that will be produced from the oil reservoir consists of crude oil, natural gas, and produced water. Production fluids will flow to the surface through tubing inserted within the cased borehole using electric submersible pumps. As hydrocarbons are produced, the natural pressure in the reservoir decreases and additional pressure must be added to the reservoir to continue production of the fluids. The additional pressure will be provided artificially to the

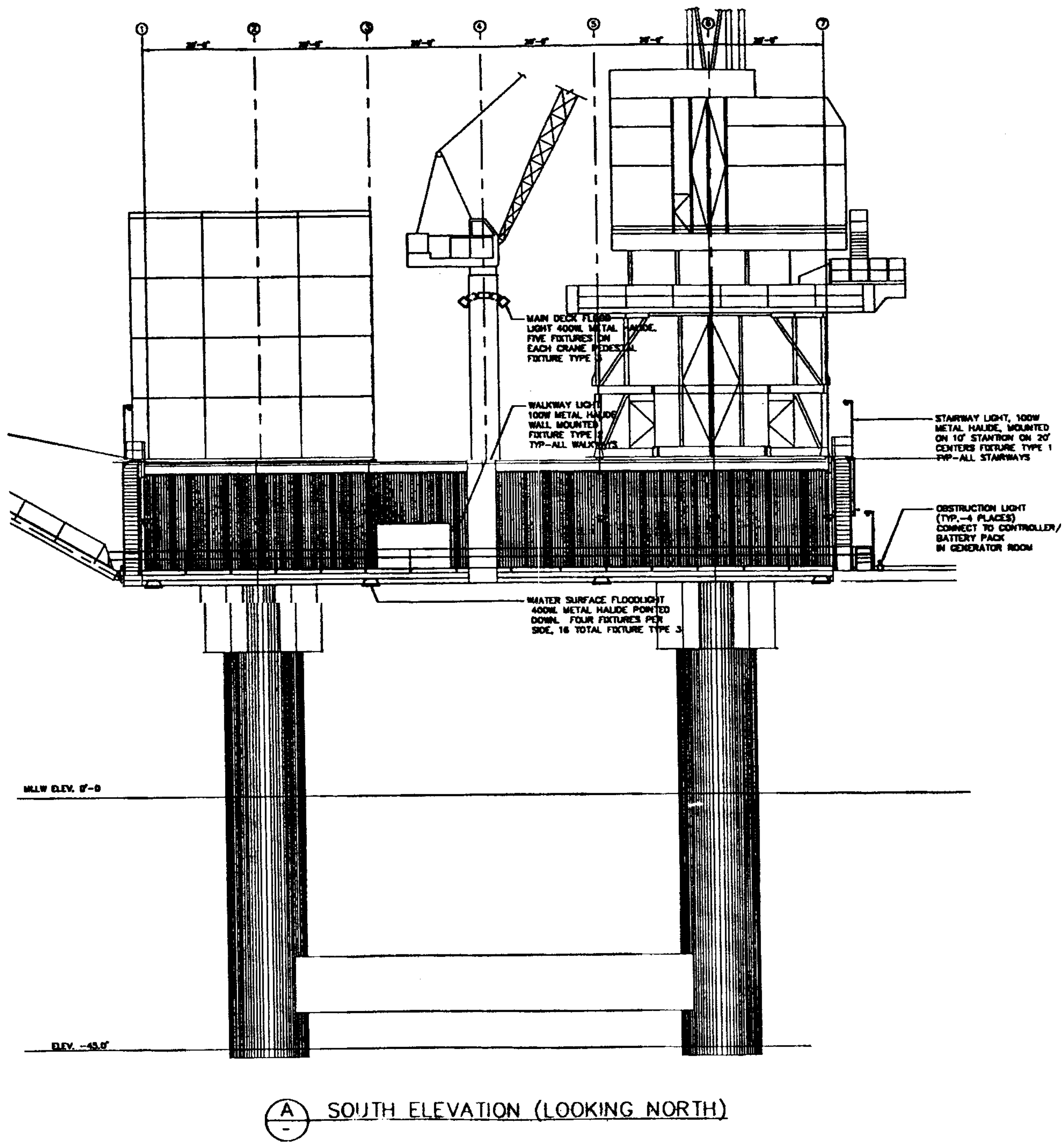


**Figure 1. General Schematic of the Osprey Offshore Drilling Unit.**

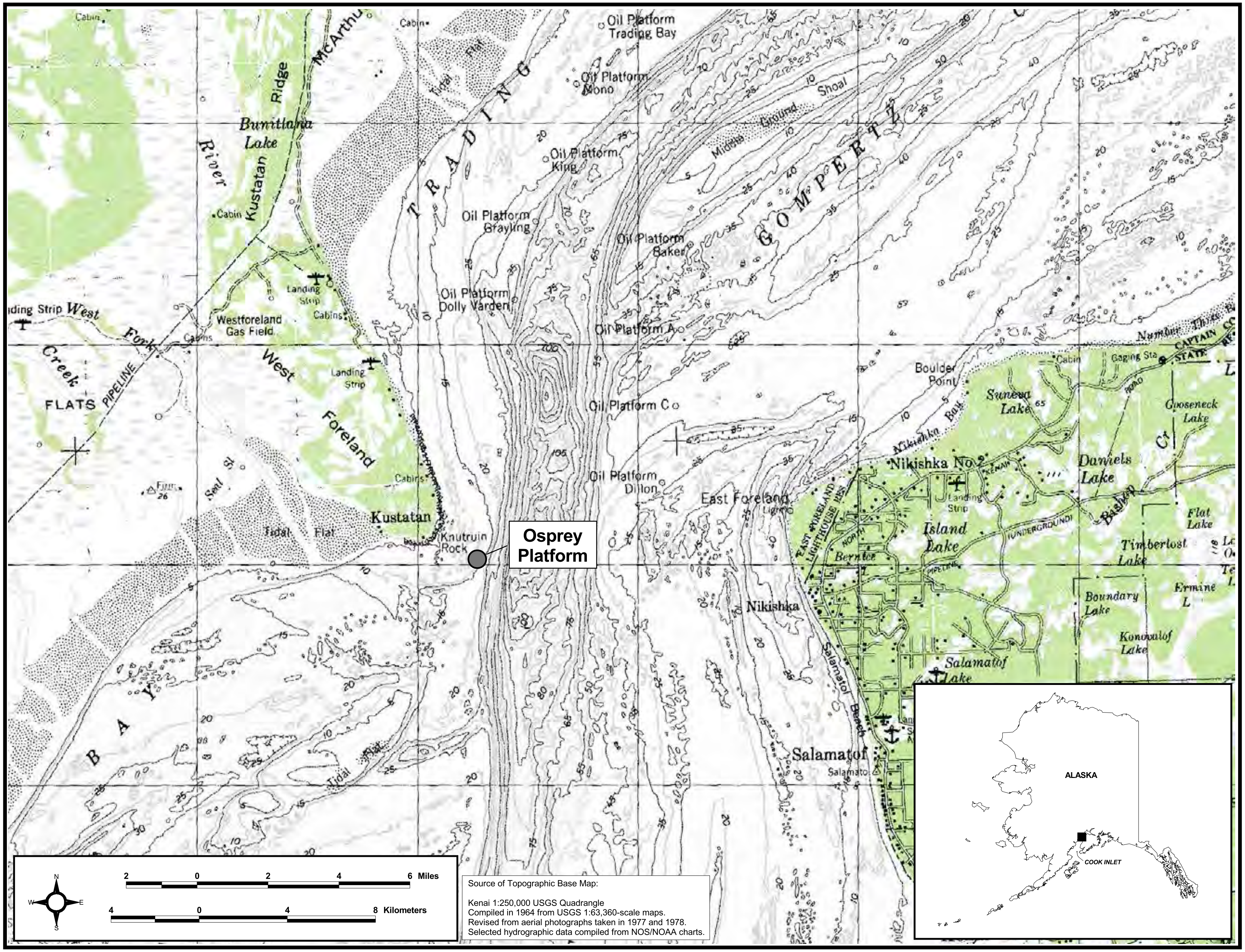


Figure 2. Location of the Osprey Platform in the Redoubt Shoal Development Area, Cook Inlet, Alaska.

reservoir using waterflooding, which is the injection of water into the reservoir to maintain formation pressure that would otherwise drop as the withdrawal of the formation fluids continues.

### 2.1.3 Fluid Separation

As the produced fluids (natural gas, crude oil, and produced water) surface from the wells, the gas will be separated from the liquids in a two-phase separator on the platform. The wet gases from the separator will pass through a glycol dehydrator to remove water and then will be used to support platform heating or will be shipped by pipeline to the onshore production facility. The liquids will be pumped to the Wet Oil Surge Vessel and then pumped to the onshore production facility for oil-water separation. There will be no storage capacity onboard the Osprey Platform for separated liquids. The produced water separated from the crude oil at the onshore production facility will then be pumped back to the Osprey Platform by pipeline for downhole injection to maintain formation pressures within the Redoubt Shoal Unit.

### 2.1.4 Well Treatment

Well treatment is the process of stimulating a producing well to improve oil or gas productivity. It is not anticipated that stimulation will be needed for the wells. However, if well treatment is required at the Osprey Platform, the method used will be acid treatment. Acid stimulation is performed by injecting acid solutions into the formation. The acid solution dissolves portions of the formation rock, thus enlarging the openings in the formation. The acid solution must be water soluble, safe to handle, inhibited to minimize damage to the well casing and piping, and inexpensive.

### 2.1.5 Workover

Workovers or treatment jobs occur approximately once per year. Workover operations are performed on a well to improve or restore productivity, repair or replace downhole equipment, evaluate the formation, or abandon the well. Workover operations include well pulling, stimulation (acidizing and fracturing), washout, reperforating, reconditioning, gravel packing, casing repair, and replacement of subsurface equipment. The four general classifications of workover operations are pump, wireline, concentric, and conventional. Workovers can be performed using the original derrick. The operations begin by using a workover fluid to force the production fluids back into the formation, to prevent them from exiting the well during the operation.

### 2.1.6 Well Drilling

Rotary drilling is the process that is used to drill the well. The rotary drill consists of a drill bit attached to the end of a drill pipe. The most significant waste streams, in terms of volume and constituents associated with the drilling activities, are drilling fluids and drill cuttings. Drill cuttings are particles (e.g., sand, gravel, etc.) generated by drilling into subsurface geological formations and carried to the surface with the drilling fluid. The drilling fluid, or mud, is a mixture of water, special clays, and certain minerals and chemicals used to cool and lubricate the bit, stabilize the walls of the borehole, and maintain equilibrium between the borehole and the formation pressure. The drilling fluid is pumped downhole through the drill string and is ejected through the nozzles in the drill bit and then circulated to the surface through the annulus. The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

## 2.2 WASTE STREAMS ASSOCIATED WITH THE PROPOSED ACTIVITY

The Final NPDES General Permit for Oil and Gas Exploration, Development, and Production Facilities in Cook Inlet AL (AKG285000, 64 FR 11885) identified 19 waste streams. According to Forest Oil's Environmental Information Document (NCG 2001), the following waste streams will not be generated at the Osprey Platform: desalination unit wastes (Discharge No. 005); uncontaminated ballast water (Discharge No. 010); bilge water (Discharge No. 011), and muds, cuttings, cement at seafloor (Discharge No. 013). The remaining waste streams are discussed in the following sections.

### 2.2.1 Drilling Fluids (Discharge No. 001)

Drilling fluids are the circulating fluids (muds) used in the rotary drilling of wells to clean and condition the hole, to counterbalance formation pressure, and to transport drill cuttings to the surface. A water-based drilling fluid is the conventional drilling mud in which water is the continuous phase and the suspending medium for solids, whether or not oil is present. An oil-based drilling fluid has diesel, mineral, or some other oil as its continuous phase with water as the dispersed phase. Production drilling operations onboard the Osprey Platform will use a combination of both freshwater-based and oil-based drilling fluids. The freshwater-based drilling fluids will typically be used for the upper 2,500 feet of the well and the oil-based drilling fluids will be used for depths below 2,500 feet (NCG 2001). The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

### 2.2.2 Drill Cuttings (Discharge No. 001)

Drill cuttings are the particles generated by drilling into subsurface geologic formations and carried to the surface with the drilling fluid. The separated drill cuttings will be disposed of in a Class II injection well that has been permitted with the Alaska Oil and Gas Conservation Commission (AOGCC).

### 2.2.3 Dewatering Effluent (Discharge No. 001)

Dewatering effluent is wastewater from drilling fluid and drill cutting dewatering activities. The dewatering effluent will be disposed of with the separated drill cuttings into a Class II injection well that has been permitted with the AOGCC.

### 2.2.4 Deck Drainage (Discharge No. 002)

Deck drainage refers to any waste resulting from platform washing, deck washing, spillage, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. This could also include pollutants, such as detergents used in platform and equipment washing, oil, grease, and drilling fluids spilled during normal operations (Avanti 1992). On the Osprey Platform, deck drainage will be treated through an oil-water separator prior to discharge (Amundsen 2000). The average flow of deck drainage from the platform will be 108,000 gallons per day (gpd) (NCG 2001), depending on precipitation. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70.020).

### 2.2.5 Sanitary Waste (Discharge No. 003)

Sanitary waste is human body waste discharged from toilets and urinals. The sanitary waste system on the Osprey Platform, an aerated marine sanitation device, will serve a 3- to 55-person crew residing on the platform at any one time. The expected maximum quantity of sanitary waste discharged is 2,020 gpd (United Industries Group 1998 and NCG 2001). The pollutants associated with this discharge include suspended solids, 5-day biochemical oxygen demand ($BOD_5$), fecal coliform, and residual chlorine. All sanitary discharges will be in accordance with the appropriate water quality standards and effluent treatability requirements for the state of Alaska (18 AAC 70, 18 AAC 72, and 40 CFR 133.105).

### 2.2.6 Domestic Waste (Discharge No. 004)

Domestic waste (gray water) refers to materials discharged from sinks, showers, laundries, safety showers, eyewash stations, and galleys. Gray water can include kitchen solids, detergents, cleansers, oil and grease. Domestic waste will not be treated prior to discharge. The expected quantity of domestic waste discharged is 4,000 gpd (NCG 2001). All domestic discharges will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.2.7 Blowout Preventer Fluid (Discharge No. 006)

Blowout preventer fluid is hydraulic fluid used in blowout preventer stacks during well drilling. According to Forest Oil's Environmental Information Document (NCG 2001), blowout preventer fluid will not be discharged from the Osprey Platform.

### 2.2.8 Boiler Blowdown (Discharge No. 007)

Boiler blowdown is the discharge of water and minerals drained from boiler drums to minimize solids build-up in the boiler. The expected quantity of boiler blowdown is 100 gpd. Boiler blowdown will be treated through an oil-water separator prior to discharge (Amundsen 2000). This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.2.9 Fire Control System Test Water (Discharge No. 008)

Fire control system test water is sea water that is released during the training of personnel in fire protection, and the testing and maintenance of fire protection equipment on the platform. This discharge is intermittent, and is expected to occur approximately 12 times per year. The expected quantity of fire control system test water is 750 gallons per minute (gpm) for 30 minutes, for a total discharge per event of 22,500 gallons. Contaminated fire control system test water will be treated through an oil-water separator prior to discharge. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

#### 2.2.10 Non-Contact Cooling Water (Discharge No. 009)

Non-contact cooling water is sea water that is used for non-contact, once-through cooling of various pieces of machinery on the platform. The expected quantity of non-contact cooling water is 300,000 gpd. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC.70).

#### 2.2.11 Excess Cement Slurry (Discharge No. 012)

Excess cement slurry will result from equipment washdown after cementing operations. This waste stream will be discharged intermittently while drilling, depending on drilling, casing, and testing program/problems (Amundsen 2000). Approximately 30 discharge events are anticipated per year, with a maximum discharge of 100 bbl (or about 4,200 gallons) per event. Excess cement slurry will not be treated prior to discharge. Discharge of this waste stream will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

#### 2.2.12 Waterflooding Discharges (Discharge No. 014)

Waterflooding discharges are discharges associated with the treatment of seawater prior to its injection into a hydrocarbon-bearing formation to improve the flow of hydrocarbons from production wells, and prior to its use in operating physical/chemical treatment units for sanitary waste. These discharges include strainer and filter backwash water. All waterflooding discharges will be disposed of in a Class II injection well that has been permitted with the AOGCC.

#### 2.2.13 Produced Water (Discharge No. 015)

Produced water refers to the water (brine) brought up from the hydrocarbon-bearing strata during the extraction of oil and gas, and can include formation water, injection water, and any chemicals added downhole or during the oil/water separation process. The produced water will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.14 Well Completion Fluids (Discharge No. 016)

Well completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the well bore during operations which prepare the drilled well for hydrocarbon production. The well completion fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.15 Workover Fluids (Discharge No. 017)

Workover fluids are salt solutions, weighted brines, polymers, or other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures. The workover fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.16 Well Treatment Fluids (Discharge No. 018)

Well treatment fluids refers to any fluid used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled. The well treatment fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.17 Test Fluids (Discharge No. 019)

Test fluids are discharges that occur if hydrocarbons located during exploratory drilling are tested for formation pressure and content. This would consist of fluids sent downhole during testing, along with water from the formation. The test fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.2.18 Produced Solids (Discharge No. 021)

Produced solids are sands and other solids deposited from produced water which collect in vessels and lines and which must be removed to maintain adequate vessel and line capacities. The produced solids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

# 3.0 DESCRIPTION OF THE PROJECT AREA

The project area is considered to be Cook Inlet waters located between the West and East Forelands area of Cook Inlet in southcentral Alaska. This area is considered to be the upper portion of lower Cook Inlet. The Cook Inlet basin is an elongated depression of the earth's crust between two major parallel mountain ranges, the Kenai Range in the southeast and the Alaska Range to the northwest (Montgomery Watson 1993). The basin is underlain by thick sedimentary deposits that exceed 30,000 feet in some places (Wilson and Torum 1968). Sedimentary rocks, such as conglomerates, sandstones, siltstones, limestone, chert, volcanics, and clastics, make up the Cook Inlet basin.

Plate movement was responsible for creating the basin and mountain ranges. Several major glaciations have altered the landscape of the region (USACOE 1993). During the Pleistocene age glaciers pushed beyond the mountain fronts into the lowlands, depositing sediment and debris up to several thousand feet thick. As the glaciers receded, Cook Inlet assumed its present form (USACOE 1993). Active volcanoes and earthquakes are common to the area as well.

Cook Inlet is characterized by extreme tidal fluctuations of up to 12.2 meters that produce strong currents in excess of eight knots (Tarbox and Thorne 1996). Tides wash in and out of the Cook Inlet basin like a very long wave (Haley et al 2000). Fluid motion on this large scale is affected by the rotation of the earth, causing incoming currents in Cook Inlet to veer toward the east coast and outgoing currents to veer to the west coast (MMS 1984). Tidal ranges on the eastern shore are generally larger than ranges on the western shore because incoming currents have more energy. In the deeper, broader areas of the lower Cook Inlet, the tidal current changes directions in an elliptical pattern, known as rotary tides (Haley et al 2000).

Water quality in upper Cook Inlet is influenced by the high currents and large volumes of seasonally varying freshwater inflows (Montgomery Watson 1993). The high tidal currents tend to keep the entire water column well mixed; little vertical stratification is present except near the mouths of major rivers (Haley et al 2000). Large, glacier-fed rivers, such as the Susitna and Knik rivers, which flow into the inlet, contribute large amounts of freshwater and suspended sediments (Montgomery Watson 1993).

The climate of the central Cook Inlet region is transitional between maritime and continental regimes (Montgomery Watson 1993). Regional topography and water bodies heavily influence area climate. The Kenai Mountains to the south and east act as a barrier to warm, moist air from the Gulf of Alaska. Precipitation in Cook Inlet averages less than 20 percent of that measured on the Gulf of Alaska side of the Kenai Mountains (Montgomery Watson 1993). The Alaska Range to the north provides a barrier to the cold winter air masses that dominate Interior Alaska. Cook Inlet waters tend to moderate temperatures in the area.

# 4.0 STATUS OF THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT IN THE PROJECT AREA

Forest Oil's Osprey Platform is located in lower Cook Inlet. Cook Inlet provides habitat for several threatened and endangered marine mammals and birds. This section describes the Threatened and Endangered Species (TES) that are present in the project area, the current stock assessments for each species, and their designated critical habitat.

## 4.1 BIRDS

Two species of threatened or endangered birds may be found in the proposed action area of the offshore Osprey platform:

- Steller's Eider (*Polysticta stelleri*)
- Short-tailed Albatross (*Phoebastria albatrus*)

### 4.1.1 Steller's Eider (*Polysticta stelleri*)

Steller's eiders are the smallest of the four eider species. Adult males can weigh up to 960 g and range from 45 to 47 cm in length (Bellrose 1980). Adult females range from 43 to 46 cm in length (Bellrose 1980). The head of the breeding male is predominantly white with black eye patches and light green tingeing on the forehead lores and below the eye. There is a broad black collar around the lower neck. Tertial feathers are bi-colored longitudinally, with the inner half being bluish-black, which gives the back a striped appearance when the wings are folded. The breast and belly are shaded chestnut to black posteriorly. The flanks, rump, and under-tail coverts are black, and the wedge-shaped tail is dark brown. Males in eclipse plumage during late summer and fall are entirely mottled brown with the exception of the wings. They resemble male's adult breeding plumage with white upper wing-coverts. Females and juveniles are mottled brown year-round and the female adult has a blue speculum bordered in white (65 FR 49).

#### 4.1.1.1 Distribution

The U.S. Fish and Wildlife Service (USFWS) recognizes three breeding populations of Steller's eider, two in the Russian Arctic and one in the Alaskan Arctic. The Russian populations are distinguished by separate breeding and wintering grounds. The Russian Atlantic population nests west of the Khatanga River and winters in the Barents and Baltic Seas. The Russian Pacific population nests east of the Khatanga River and winters in the southern Bering Sea and North Pacific Ocean, where it presumably mixes with the Alaskan breeding population. The Alaskan population of Steller's eider nests along the western Arctic Coastal Plain in northern Alaska from approximately Point Lay east to Prudhoe Bay, and in extremely low numbers along the Yukon-Kuskokwim Delta (65 FR 49). The extent of wintering grounds for this population is currently unclear, although the USFWS has proposed to designate much of southwest and south coastal Alaska as critical winter habitat under the Endangered Species Act (65 FR 49).

#### 4.1.1.2 Life History

There is little information on the life history of Steller’s eiders. Nesting occurs on the North Slope of Alaska in early to mid-June. The incubation period is approximately 24 days (Larned et al. 1992). Seasonal nesting distribution of the Alaskan breeding population of Steller’s eiders varies from year to year. Historically, nesting ranged from St. Lawrence Island and the Hooper Bay area north to Barrow (AOU 1997), and has been rare east of Point Barrow. Steller’s eiders migrate southward along the northwest coast of Alaska (Gabrielson and Lincoln 1959) to the Alaskan Peninsula, where they undergo a flightless molt for approximately ten to fourteen days (65 FR 49). Molting also occurs near St. Lawrence Island in the Bering Sea and on Karaginski Island in Russia (Kistchinski 1973). Additional molting areas have not yet been identified.

After molting, Steller’s eiders are thought to over-winter in relatively ice-free marine waters from Kodiak Island west to Unimak Island, Alaska (Palmer 1976) and into lower Cook Inlet (USFWS 2000). Although movements of Steller’s eiders within their winter range are unclear, recent observations of Steller’s eiders wintering in Cook Inlet may indicate that Steller’s eiders are associated with river mouths, due to concentrated food sources. USFWS biologists have seen rafts of Steller’s eiders annually in the same area, within a mile of Deep Creek and the Ninilchik River, on the Kenai Peninsula (T. Antrobus, USFWS, pers. comm.).

The timing of spring migration to nesting grounds is dependent on weather conditions. Kessel (1989) noted that eiders move through the Bering Strait between mid-May and early June, returning to their nesting grounds. Generally, Steller’s eiders gather in staging areas before beginning their spring migration. These staging areas can contain thousands to tens of thousands of eiders and are primarily located along the northern side of the Alaskan Peninsula, including Port Heiden, Port Moller, Nelson Lagoon, and Izembek Lagoon (65 FR 49). Staging areas for the spring migration may also be used as winter habitat. If environmental conditions are not suitable at a staging area, eiders will disperse to await better conditions. Once favorable weather conditions exist, they begin their northward migration. Inclement weather may slow or delay migration, and eiders have been observed along the southwestern coast waiting for more favorable migration conditions to occur.

#### 4.1.1.3 Diet

Little is known about the Steller’s eider diet during the breeding season (Quakenbush and Cochrane 1993). Peterson (1981) collected stomach samples of 96 eiders in Nelson Lagoon to determine diet. Samples were taken from three birds from feeding flocks every three weeks between April 17 and October 15, 1977 and from five birds of each age-sex category every two weeks between June 25 and October 1, 1979 (Peterson 1981). Peterson found blue mussels, other bivalves, and amphipods to be the primary prey. Troy (1988) found that mollusks comprised 88% (86% bivalves, 2% gastropods) and crustaceans comprised 8 % of the diet of eiders collected in southwest Alaska during September-October 1986, February-March 1987, and April-May 1987. Cottom (1939) reported that during the nesting season, 87% of eider diet is comprised of animal matter. Crustaceans, amphipods, and mollusks made up the largest percentage of prey species (45%, 39%, and 19% respectively).

Most data suggest little seasonal variation in the type of prey consumed, but proportions of each food type consumed may vary seasonally (Peterson 1981). Available literature on eider feeding habits suggests that eiders dive near shore to feed during the winter (64 FR 49). USFWS biologists speculate that Steller's eiders could be feeding on increased invertebrates because of nutrient loads associated with spawned salmon carcasses flushed from area rivers (T. Antrobus, USFWS, pers. comm.)

#### 4.1.1.4 Predation

Raptors, gulls, jaegers, ravens, and foxes are the main predators of Steller's eiders. Gulls are thought to harass eiders in winter feeding grounds, as well as in nesting areas (65 FR 49).

#### 4.1.1.5 Population Status

It is unclear whether the Alaskan breeding population of Steller's eider is declining, stable, or increasing. Eiders typically occur at low densities in the portion of the current breeding habitat that has been surveyed (65 FR 49). These factors make estimating abundance difficult. The USFWS currently conducts aerial surveys for nesting eiders on the North Slope of Alaska, but breeding population estimates vary greatly. Consequently, the abundance of nesting Alaskan Steller's eider is unknown (65 FR 49). However, USFWS estimates that hundreds or thousands of Steller's eiders occur in North Slope breeding flocks.

Although there is no current estimate for the number of nesting Steller's eiders on the Yukon-Kuskokwim Delta, their abundance has dramatically declined since 1960 (Kertell 1991). USFWS has yet to find a way to detect nesting eiders other than with aerial surveys, a technique that has been unsuccessful in the past on the Yukon-Kuskokwim Delta.

On December 10, 1990, the USFWS was petitioned to list the Steller's eider as endangered throughout its range and to designate critical habitat. In August 1993, the USFWS reviewed the status of Steller's eider and concluded that the available information did not support listing the species range-wide, but did support listing the Alaskan breeding population. Subsequently, the USFWS listed the Alaskan breeding population of Steller's eiders as threatened under the Endangered Species Act on June 11, 1997.

#### 4.1.1.6 Critical Habitat

In January 2001, the USFWS designated approximately 7,330 square km of marine waters and land as critical habitat into five units (USFWS 2001). These units are located along the coastal areas of the Yukon-Kuskokwim Delta and along the Alaska Peninsula. Although Steller's eiders use a variety of habitats in Cook Inlet, none were designated as critical in the final rule.

#### 4.1.1.7 Factors Affecting Survival

Little is known about the population dynamics of Steller's eiders. The reduction of eiders on historical breeding grounds suggests that Steller's eiders are either abandoning these historic nesting areas or that the population is declining. Currently, the causes of the population declines in Steller's eiders is unknown. Possible causes of decline include habitat loss or modification, increased predation in areas where human activities have artificially expanded predator populations by providing shelter and alternative food sources, lead poisoning on the Yukon-Kuskokwim Delta caused by the ingestion of lead shot while feeding, and food availability caused by changes in the Bering Sea ecosystem (USFWS 2000). In Siberia, possible causes of Steller's eider decline could also include habitat loss on the breeding grounds due to oil and gas exploration and unreported subsistence hunting (USFWS 2000).

### 4.1.2 Short-tailed Albatross (*Phoebastria albatrus*)

The short-tailed albatross is a pelagic seabird with long, narrow wings adapted for soaring low over the water. Its pink bill is hooked with a blue tip and has external tubular nostrils. The short-tailed albatross has a white back and a white head with yellow/gold crown and nape (Sherburne 1993). It is the largest of the three species of Northern Pacific albatross, with an average wingspan of 84 inches and an average body length of 37 inches (Farrand 1983).

#### 4.1.2.1 <u>Distribution</u>

The short-tailed albatross was historically found year-around in the North Pacific from Siberia to the western coast of North America and the Bering Sea to the Hawaiian Islands (Roberson 1980). King (1981) reported their range as being approximately 66 degrees north latitude to 10 degrees north latitude.

#### 4.1.2.2 <u>Life History</u>

Historically, the short-tailed albatross bred only in the western North Pacific (Sherburne 1993) on islands in Japan and Taiwan (63 FR 211). There are only two known active breeding colonies, one on Torishima Island and one on Minami-kojima Island. Sherburne (1993) stated that several short-tailed albatross have been sighted in the Hawaiian Islands during the breeding season, but no known nesting has occurred.

The short-tailed albatross has a relatively long life span, like many seabirds, and may reach 40 years of age (Sherburne 1993). Breeding age is approximately 6 years, at which time short-tailed albatross begin nesting every year. The short-tailed albatross is a monogamous, colonial nester and returns to nesting areas every year. Short-tailed albatross usually arrive at breeding colonies in Torishima, Japan in October and lay eggs by the end of the month. Females lay a single egg, and both parents incubate the egg for approximately 65 days. By late May, the chicks are almost full-grown and the adults leave, leaving the chicks to fledge (63 FR 211). Koblentz-Mishke (1965) suggested that post-nesting distribution coincides with increased abundance of zooplankton and increasing numbers of organisms at each trophic level, causing a northeastern movement towards the Aleutian Islands and the Bering Sea.

#### 4.1.2.3 Diet

The diet of short-tailed albatross includes squid, small fish, and crustaceans (DeGrange 1981). Currently there is no information on diet by season, habitat, or environmental condition (63 FR 211).

#### 4.1.2.4 Predation

Terrestrial predators of short-tailed albatross chicks include crows (*Corus* sp.) and possibly introduced black rats and domestic cats on Torishima Island. Sharks are possible pelagic predators of this albatross as well (63 FR 211).

#### 4.1.2.5 Population Status

Currently, the short-tailed albatross is listed as endangered throughout its range under the 1973 Endangered Species Act. Alaska also lists the short-tailed albatross as endangered under the State of Alaska list of endangered species. The current world population of the short-tailed albatross is estimated to be 500 to 1000 individuals.

#### 4.1.2.6 Critical Habitat

Critical habitat, as defined in Section 3 of the ESA, has not been proposed by the USFWS for the short-tailed albatross. This is based on the USFWS's determination that critical habitat would not benefit the species. Documented critical habitat for the albatross occurs outside U.S. jurisdiction. However, important foraging habitat of the short-tailed albatross under U.S. jurisdiction includes the coastal regions of the North Pacific Ocean and Bering Sea during the non-breeding season and throughout the northwestern Hawaiian Islands during the breeding season. Potential nesting habitat occurs on Midway Atoll in the Hawaiian Islands (63 FR 211).

#### 4.1.2.7 Factors Affecting Survival

The USFWS has identified several factors that could affect the recovery of the short-tailed albatross or exacerbate its decline. The decline in abundance of the short-tailed albatross has been attributed primarily to Japanese entrepreneurs harvesting the birds for flesh and feathers in the late nineteenth century. Japanese ornithologist Yoshimaro Yamashina estimated that at least 5 million albatross were killed between 1878 and 1902 (63 FR 211).

In addition to hunting, natural disasters could contribute to further population decline. Torishima Island, the location of the main breeding colony for the short-tailed albatross, is a volcanic island. The volcano on the island is active and has erupted four times. In 1939, the breeding grounds were buried in a volcanic eruption. The magnitude of habitat destruction potentially caused by an eruption is unknown, although the possibility exists for catastrophic mortality among the 500 breeding birds. Incidental mortality by longline fishing in the North Pacific and Bering Sea is also a possible threat to the species. The magnitude of impacts caused by international longline fisheries has been assessed in a biological opinion by USFWS dated March 19, 1999. However, longline fishing is not thought to threaten the continued survival of short-tailed albatross at the current population size (63 FR 211). In addition, oil contamination can result in physiological problems and can interfere with the bird's ability to thermoregulate (63 FR 211).

A decline caused by any of the above factors may be exacerbated by a lack of genetic diversity in the population with only 500 breeding individuals (64 FR 112). Low genetic diversity can cause a population to become more vulnerable to diseases, habitat loss or degradation and may inhibit recovery.

## 4.2 MARINE MAMMALS

Five species of endangered marine mammals can be found in lower Cook Inlet, where Forest Oil's Osprey Platform is located. The animals of concern are listed below.

- Steller sea lion (*Eumetopias jubatus*), western stock
- Fin whale (*Balenoptera physalus*)
- Humpback whale (*Magaptera novaeangliae*)
- Blue whale (*Balaenoptera musculus*)
- Northern Right whale (*Eubalaena glacialis*)

In addition, the beluga whale (*Delphinapterus leucas*) is a species of special concern inhabiting Cook Inlet and the project area.

### 4.2.1 Steller sea lion (*Eumetopias jubatus*), western stock

In 1997, the National Marine Fisheries Service (NMFS) designated the western stock of Steller sea lions (those west of longitude 144) as endangered under the Endangered Species Act (62 FR 30772). Steller sea lions range along the North Pacific Rim from northern Japan to California (Loughlin et al. 1984). The centers of abundance and distribution are located in the Gulf of Alaska and the Aleutian Islands. The species is non-migratory, but individuals may disperse widely and potentially intermingle with animals from other areas (Hill and DeMaster 2000). Juveniles and adult males may visit multiple rookeries and hauling grounds during the winter. During the breeding season, adult females have a limited dispersal (NMFS 1995).

#### 4.2.1.1 Distribution

Steller sea lion habitat includes marine and terrestrial areas. Rookeries are sites where adult animals congregate for pupping and breeding. Rookeries are usually located on beaches of relatively remote islands, often in areas exposed to wind and waves, where access by humans and other mammalian predators is difficult (NMFS 1995). Rookeries may include areas of sand, gravel, cobble, boulder, and bedrock. Rookeries may extend across low-lying reefs and islands or may be restricted to narrow beaches near cliff faces (NMFS 1995).

Haul-outs are areas used by adult sea lions during times other than the breeding season. Nonbreeding adults and subadults use haul-outs throughout the year. Subadult and adult males that are unable to hold territories often occupy haul-outs adjacent to rookery sites. Rookery sites are often used as haul-outs during the non-breeding season (NMFS 1995).

Male and juvenile Steller sea lions disperse widely after the breeding season. During fall and winter in Alaska, sea lions occur at rookeries and haul-out sites that are used during the summer or at locations unoccupied in summer.

#### 4.2.1.2 Life History

Steller sea lions are the largest member of the family *Otariidae* and show pronounced sexual dimorphism with males being significantly larger. At birth, pups weigh from 16 to 23 kg and measure 100 to 120 cm in length (Calkins and Pitcher 1982). Most females reach adult size and maximum skeletal growth by age 6. Males reach maximum size at age 10 to 11, although variability among age classes is high. The average mass of adult males is 566 kg (maximum of about 1,120 kg) and average length is 282 cm. Adult female mass averages 263 kg (maximum of about 350 kg) with an average length of 228 cm (Calkins and Pitcher 1982; Fiscus 1961; Loughlin and Nelson 1986).

Adult female Steller sea lions usually breed annually (Calkins and Pitcher 1982) and reach sexual maturity between 3 and 6 years of age (Mathisen et al. 1962; Pitcher and Calkins 1981). Males reach sexual maturity between 3 and 7 years of age. Females produce a single pup each year. Pups are born from late May to early July. Birth rates based on the number of females pregnant in April and May are about 60% to 75% throughout the range (Calkins and Pitcher 1982; Calkins and Goodwin 1988). Young are usually weaned by the end of their first year but may continue to nurse until age 3 (Lowry et al. 1982).

In the Gulf of Alaska, Steller sea lion mortality from birth to age 3 was estimated at 53%. In age classes 3 through 11 years, the average yearly mortality was 11% and remained close to that level in older age classes (Calkins and Pitcher 1982). There may be some sexual specific differences in mortality, but the trends are not clear. Female sea lions may live to age 30 and males to about 20 years (Calkins and Pitcher 1982).

Steller sea lion pup mortality occurs from drowning, starvation caused by separation from the mother, crushing by larger animals, disease, predation, and biting by females other than the mother (Orr and Poulter 1967; Edie 1977). Juvenile and adult Steller sea lions are eaten by sharks and killer whales but the rates and significance of this predation is not known.

#### 4.2.1.3 Diet

Steller sea lions eat a variety of fishes and invertebrates. Small demersal and off-bottom schooling fishes are the most common prey of sea lions in Alaska. Octopus and squid are also commonly eaten (NMFS 1995). Harbor seals (*Phoca vitulina*), spotted seals (*P. largha*), bearded seals (*Erignathus barbatus*), ringed seals (*P. hispida*), fur seals, California sea lions (*Zalophus californianus)* and sea otters (*Enhydra lutris*) are also occasionally eaten (Tikhimirov 1959; Gentry and Johnson 1981; Pitcher 1981; Pitcher and Fay 1982; Byrnes and Hood 1994). In diet studies conducted since 1975, walleye pollock (*Theragra chalcogramma*) was the principal prey in most areas of the Gulf of Alaska and the Bering Sea. However, Pacific cod

(*Gadus macrocephalus*), octopus, squid, Pacific herring (*Clupea harengus*), capelin (*Mallotus villosus)*, Pacific sand lance (*Ammodytes hexapterus)*, flatfishes, and sculpins were also consumed (NMFS 1995). Analysis of scats collected during 1990 to 1992 in the Aleutian Islands suggests that Atka mackerel (*Pleurogrammus monoterygius*) was the most common prey in the region followed by walleye pollock and Pacific salmon (*Oncorhynchus* spp.) (NMFS 1995). Energy requirements of Steller sea lions are not well known. Keyes (1968) suggested that adult, nonpregnant, nonlactating sea lions require 6% to 10% of their body weight in food per day. However, this estimate was made from feeding rates of captive sea lions and may not reflect the energy requirements of free-ranging animals.

#### 4.2.1.4 Predation

Known predators of Steller sea lions include sharks and killer whales *(Orcinus orca).*

#### 4.2.1.5 Population Status

The most recent estimate of Steller sea lion abundance is based upon aerial surveys during June 1998 and ground-based pup counts in June and July, 1998 (Sease and Loughlin 1999). These surveys suggest a minimum abundance of 39,031 Steller sea lions in the western U.S. stock in 1998. This count estimated 9,373 pups, 28,658 non-pups and included an estimate of 1,000 animals for unsurveyed sites (Hill and DeMaster 2000). These counts have not been corrected to account for animals that were at sea during the surveys.

The first reported trend counts of Steller sea lions in Alaska were made in 1956 to 1960 and indicated that at least 140,000 sea lions reside in the Gulf of Alaska and Aleutian Islands (Kenyon and Rice 1961; Mathisen and Lopp 1963). Counts in 1976 and 1979 estimated 110,000 sea lions and suggested a major population decrease in the Aleutian Islands beginning in the mid 1970s (Braham et al. 1980). The decline appeared to spread eastward to the Kodiak Island area during the late 1970s and early 1980s and to the central and western Aleutian Islands during the early and mid-1980s (Merrick et al. 1987; Byrd 1989). Between 1985 and 1989, large declines (greater than 50%) occurred and by 1990, the decline encompassed all of the area from Prince William Sound to the western Aleutian Islands (NMFS 1995). The largest declines occurred in the eastern Aleutian Islands and western Gulf of Alaska, but declines have also occurred in the central Gulf of Alaska and the central Aleutian Islands. Counts at trend sites from 1990 to 1996 indicate a 27% decline. Counts at trend sites in 1998 suggest that the number of sea lions in the Bering Sea/Aleutian Islands region has declined 7.8% since 1996 (Hill and DeMaster 2000).

#### 4.2.1.6 Critical Habitat

Steller sea lions use specific locations along the coast of Alaska as rookeries and haul-out sites. All sea lion haul-out sites are considered critical habitat because of their limited numbers and high-density use. Alteration of these areas through disturbance or habitat destruction could have a significant impact on the use of these sites by sea lions. Protection measures currently in effect are directed at limiting activities and disturbance of sea lions. These include a 3-nautical-mile no-entry zone around rookeries and haul outs, prohibition of groundfish trawling within 10 to 20 nautical miles of certain rookeries, and spatial and temporal allocation of Gulf of Alaska pollock total allowable catch (50 CFR 226.12). In 1999, measures included: reductions in the removal of Atka mackerel within areas designated as critical habitat in the central and western Aleutian Islands; greater temporal dispersion of the Atka mackerel harvest; further temporal and spatial dispersal of the Bering Sea and Gulf of Alaska pollock fisheries; closure of the Aleutian Islands to pollock trawling; and expansion of the number and extent of buffer zones around sea lion rookeries and haulouts.

Sea lion rookeries in Alaska are located in the Pribilof Islands, on Amak Island north of the Alaska Peninsula, throughout the Aleutian Islands and western Gulf of Alaska to Prince William Sound, and on Forrester Island, White Sisters and Hazy Island in southeast Alaska. Haul-outs are numerous throughout the breeding range.

4.2.1.7 Factors Affecting Survival

Range-wide population surveys suggest that Steller sea lions have not redistributed themselves and that emigration is insufficient to account for the observed declines (Loughlin et al. 1992). This suggests that the proximate cause of the decline must be changes in reproductive or survival rates (NMFS 1995).

Declines in juvenile survival appear to be an important proximate cause of the decline in the Alaskan population of Steller sea lions from the early 1980s to the present. Since 1985, NMFS and Alaska Department of Fish and Game (ADFG) researchers have noted a reduced abundance of juvenile animals on declining rookeries (Merrick et al. 1987; NMFS and ADFG unpublished data, cited in NMFS 1995). York (1994) suggested a 10 to 20% decrease in juvenile (ages 0 to 4) survival in the Kodiak Island population, and Pascual and Adkinson (1994) concluded that juvenile survival could have declined as much as 30% to 60%.

Changes in the early (1 to 2 months) survival of Steller sea lion pups do not explain the decline in juvenile survival (NMFS 1995). Few dead pups are observed on rookeries during annual pup counts and pup mass (Merrick et al. 1994) and physiological studies (Castellini 1993; Rea et al. 1993) indicate that pups in decline areas are as large and healthy as pups in areas not experiencing declines. However, girth and mass of sea lions ages 1 to 10 years old collected in the Kodiak Island area in 1985-1986 were significantly less than in the 1970s (Calkins and Goodwin 1988). These data imply that declines in juvenile survival probably occur after the first months of life (NMFS 1995).

Despite the apparent declines in juvenile survival, the large scale declines which occurred in the Aleutian Islands during the 1970s and from 1985 to 1989 are too large to be caused solely by changes in juvenile survival. NMFS (1995) suggests that acute declines in adult survival were overlaid on an ongoing, chronic decline in juvenile survival.

Changes in reproductive rates do not appear to be important in the decline of Steller sea lion populations (NMFS 1995). Near-term pregnancy rates found in animals in 1985 in the Gulf of Alaska were not significantly different from those found in 1975 to 1978 (Pitcher and Calkins 1981; Calkins and Goodwin 1988). Merrick et al. (1988) indicates that the number of pups relative to the number of females on rookeries remains relatively high and York (1994) suggested that a much larger decrease in fecundity compared to juvenile survival would be required to produce the observed decline in Steller sea lion populations.

Data suggest that the ultimate factor (or factors) that have caused the decline in Alaskan populations of Steller sea lions would have to:

- Heavily reduce juvenile survival;
- Be chronic, rather than acute, since the decline has continued for more than a decade;
- Be widespread because concurrent declines have occurred throughout southwestern Alaska;
- Occasionally manifest itself as an acute large decline in survival of both juvenile and adult animals.

A number of factors do not appear to be important in the decline of Steller sea lion populations, including the effects of toxic materials, parasites, entanglement, commercial and subsistence harvest, disturbance, and predation (NMFS 1992). Factors that remain under consideration are shooting, incidental take in fisheries, disease, and changes in the quantity or quality of the prey base.

### 4.2.2 Fin Whale (*Balenoptera physalus*)

#### 4.2.2.1 <u>Distribution</u>

Fin whales are migratory and range from subtropical to arctic waters. The summer distribution of fin whales extends from central California to the Chukchi Sea. In Alaskan waters, some whales spend the summer feeding in the Gulf of Alaska, while others migrate farther north. Bering Sea fin whales appear to divide into two groups (Morris 1981). One group, consisting mainly of mature males and females without calves, follows the shelf break zone to Cape Navarin (Morris 1981). A second group, mainly juveniles and lactating females, remains in the region north of Unimak Pass (Morris 1981). Fin whales feed throughout the Bering and Chukchi Seas from June through October. Other summer feeding concentration areas occur along upwelling fronts and include the areas southwest of St. Matthews Island and south of the Aleutian Islands (Nasu 1966). Fin whales occur primarily in high-relief areas where biological productivity is probably high (Brueggeman et al. 1988).

Fin whales winter in subtropical to temperate waters off the coast of California. Migration southward begins in September and extends through November. The winter distribution extends from central California to Baja California (around 20º N latitude), where much of the population is thought to winter far offshore (Leatherwood et al. 1982). A few animals may remain in Alaskan waters in the Navarin Basin (Brueggeman et al. 1984). Northward migration begins in spring with migrating whales entering the Gulf of Alaska from early April to June (MMS 1996).

Most sightings of fin whales in southcentral Alaskan waters have been documented in the Shelikof Strait, near Kodiak Island and lower Prince William Sound (Montgomery Watson

1993). Authenticated sightings of fin whales are rare in Cook Inlet as most documentation has been based on carcass sightings (M. Eagleton, NMFS, pers. comm.)

4.2.2.2 Life History

Fin whales usually breed and calve in the warmer waters of their winter range. Peak breeding season occurs between November and February, but can occur in any season (Tomilin 1967; Ohsumi 1958).

4.2.2.3 Diet

The diet of fin whales consists of euphausiids, copepods, fish and squid. Euphausiids are consumed from July to September when large swarms form over the continental shelf margin where upwelling occurs (Nemoto 1970). Nemoto (1959) suggested that copepods are an important food item in spring and early summer when water temperatures are low, but that later in the year euphausiids are of greater importance. Fin whales also eat a wide variety of fish including herring, capelin, pollock, and arctic cod. Tomilin (1967) reported that 97% of the diet of 156 fin whales taken on the continental shelf was fish (primarily pollock). Their diet appears to vary from year to year and from location to location depending on prey abundance (Lowry et al. 1982).

4.2.2.4 Population Status

Based on population modeling, it is estimated that the North Pacific population ranged from 42,000 to 45,000 individuals before the advent of modern whaling. The population of fin whales was reduced to between 14,620 to 18,630 individuals by the time commercial whaling ended (Ohsumi and Wada 1974). North Pacific fin whales have been protected from commercial whaling since 1976. Reliable current abundance estimates of fin whales are not available (Hill and DeMaster 2000). A survey conducted in August 1994 covering 2,050 nautical miles of trackline south of the Aleutian Islands encountered only four fin whale groups (Forney and Bownell 1996). However, this survey did not include all of the waters off Alaska where fin whale sightings have been reported. Information on current trends in the population numbers of fin whales is not available (Hill and DeMaster 2000). There are no published reports that indicate recovery of this stock has or is taking place (Braham 1992; Hill and DeMaster 2000).

4.2.2.5 Critical Habitat

No critical habitat in Alaska has been designated for this species.

4.2.2.6 Factors Affecting Survival

There have been no reports of incidental mortality of fin whales related to commercial fishing operations in the North Pacific during this decade, nor have subsistence hunters in Alaska and Russia reported take of fin whales from this stock (Hill and DeMaster 2000). Hill and DeMaster (2000) concluded that the annual rate of human-caused mortality and serious injury appears minimal for the fin whale.

### 4.2.3 Humpback Whale (*Magaptera novaeangliae*)

4.2.3.1 Distribution

The humpback whale is distributed worldwide, though it is less common in Arctic waters (Hill and DeMaster 2000). Most humpback whales occur in temperate and tropical waters (between $10^{o}$ and $23^{o}$ latitude north and south) during winter. Humpback whales in the North Pacific are seasonal migrants that feed in the cool, coastal waters of the western United States, western Canada, and the Russian far east (NMFS 1991a). The historic feeding range of the humpback in the North Pacific included coastal and inland waters around the Pacific rim from Point Conception, California north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Nemoto 1957, Tomilin 1967, Johnson and Wolman 1984). Sightings of humpbacks are rare in Cook Inlet, although they are common around the Barren Islands, south of Cook Inlet, in the summer months (M. Eagleton, NMFS, pers. comm.).

4.2.3.2 Life History

Humpback whale summer feeding grounds extend from central California and Washington State, through Southeast Alaska and the Aleutian Islands to the Bering and Chukchi seas. In the Bering Sea, most sightings have been recorded near Unimak Pass, the eastern Aleutian Islands, and the outer shelf east of the Pribilof Islands. In the Gulf of Alaska, concentration areas include the Portlock and Albatross Banks and the eastern Aleutian Islands, Prince William Sound, and the inland waters of southeast Alaska (Berzin and Rovnin 1966). Breeding and calving occur on the wintering grounds and most births occur between January and March (Johnson and Wolman 1984).

4.2.3.3 Diet

The diet of humpback whales consists of euphausiids, amphipods, mysids, and small schooling fish including Pacific herring, capelin, anchovies, sardines, cod, and sand lance (Wolman 1978; Wing and Krieger 1983). Humpback whales are thought to feed mainly during the summer period. Wolman (1978) reported that stomachs examined during the winter months in coastal or subtropical waters of both hemispheres were generally empty. Feeding occurs at the surface or in the midwater regime. Humpbacks capture food items by engulfing their prey or by laterally feeding at the surface.

4.2.3.4 Population Status

In the past, the humpback whale population in much of this range was greatly reduced by intensive commercial whaling (Hill and DeMaster 2000). Currently, surveys indicate at least three relatively separate populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Calambokidis et al. 1997, Baker et al. 1998). The Western North Pacific stock spends winter and spring in waters off Japan and migrates to the Bering Sea and Aleutian Islands in the summer and fall (Berzin and Rovnin 1966, Nishiwaki

1966, Darling 1991). The California/Oregon/Washington and Mexico stock winters in coastal Central America and Mexico, migrating to the coast of California to British Columbia in summer and fall (Calambokidis et al. 1989, Steiger et al. 1991, Calambokidis et al. 1993). The Central North Pacific Stock winters in the Hawaiian Island waters and migrates to northern British Columbia/Southeast Alaska and Prince William Sound west to Kodiak Island (Baker et al. 1990, Perry et al. 1990, Calambokidis et al. 1997). Some exchange of stocks between winter/spring areas has been documented, as well as movement between Japan and British Columbia and Japan and the Kodiak Archipelago (Darling and McSweeney 1985, Baker et al. 1986, Darling and Cerchio 1993, Darling et al. 1996, Calambokidis et al. 1997).

The North Pacific humpback whale population was estimated at between 1,400 and 2,000 individuals in 1991 (NMFS 1991a). Prior to commercial whaling, an estimated 15,000 humpbacks inhabited the North Pacific. Current estimates for the western North Pacific humpback whale stock (the stock most likely utilizing the Cook Inlet area) is 394 animals (NMFS 2000a). Reliable information on trends in abundance for the western North Pacific Stock is currently not available (Hill and DeMaster 2000). Barlow and Clapham (1997) have estimated a population growth rate of 6.5% for humpback whale populations in the Gulf of Maine. However there are no similar estimates for humpback whale populations in the North Pacific (Best 1993). Wade and Angliss (1997) recommend a maximum net productivity rate of 4% for this stock.

#### 4.2.3.5 Critical Habitat

No critical habitat in Alaska has been designated for this species.

#### 4.2.3.6 Factors Affecting Survival

Reliable information on the trends in abundance for the Western North Pacific humpback whale is not available. No commercial fishery-related mortalities have been observed during 1990 to 1997 monitoring. The annual estimated mortality rate due to commercial fisheries is 0.2 whales per year. However, this is considered a minimum rate since no data are available from Japanese, Russian, or international waters (Hill and DeMaster 2000).

### 4.2.4 Blue Whale (*Balenoptera musculus*)

#### 4.2.4.1 Distribution

Blue whales are present in the waters off California to Alaska during the summer. Compared to other large cetaceans, the blue whale migration is more limited in northern waters. Modern whaling data suggest that blue whale abundance peaks in the eastern Gulf of Alaska in July and near the eastern Aleutian Islands in June (Rice 1974). Marking studies found little movement of blue whales while they were on their feeding grounds (Morris et al. 1983). Blue whales occur in relative abundance in a narrow area just south of the Aleutian Islands from 160° W to 175° W longitude (Berzin and Rovnin 1966, Rice 1974). The species is also distributed in an area north of 50° N latitude extending from southeastern Kodiak Island across the Gulf of Alaska and from southeast Alaska to Vancouver Island (Berzin and Rovnin 1966).

#### 4.2.4.2 Life History

Blue whales usually begin migrating south out of the Gulf of Alaska by September (Berzin and Rovnin 1966). Migration routes are thought to be along the western coast of North America. The North Pacific blue whale population winters from the open waters of the mid-temperate Pacific south to at least 20° N latitude (MMS 1996). Leatherwood et al. (1982) reported that blue whales occur up to 1,300 to 2,800 km offshore of Central America and at least as far south as Panama.

The northward spring migration of the North Pacific population begins in April or May, with whales traveling along the American shore of the Pacific (Berzin and Rovnin 1966). Blue whales are sighted off Baja California and the Mexican mainland in February, with peak densities occurring in April. Mating and calving take place over a five-month period during the winter (Mizroch et al. 1984).

#### 4.2.4.3 Diet

The diet of blue whales consists primarily of krill, small euphausiid crustaceans, primarily on their summer range (Nemoto 1959, Berzin and Rovnin 1966).

#### 4.2.4.4 Population Status

It is estimated that prior to exploitation by commercial whaling, there were about 4,900 to 6,000 blue whales in the North Pacific. The most recent estimate of the North Pacific blue whale population was approximately 1,700 individuals (Barlow and Gerrodette 1996). There have been many reported sightings off the coast of Mexico and California but no reliable census data are available for population estimates. Currently, it is unknown whether the blue whale population is increasing, decreasing, or stable (MMS 1996).

Whaling records indicate that large concentrations of this species once occurred in the northern part of the Gulf of Alaska southwest of Prince William Sound in the Port Banks area (Nishiwaki 1966) and in an area west of the Queen Charlotte Islands and southeast Alaska (Berzin and Rovnin 1966). Recent sightings in Alaskan waters have been scant (MMS 1996).

#### 4.2.4.5 Critical Habitat

No critical habitat in Alaska has been designated for this species.

#### 4.2.4.5 Factors Affecting Survival

There is relatively little information on the abundance or mortality of blue whales since hunting ceased in 1967 (MMS 1996). Given the low number of opportunistic sightings, the low population estimates relative to their initial abundance, and the low intrinsic rate of increase for most baleen whale populations, it is unlikely that blue whale populations are recovering (Mizroch et al. 1984).

### 4.2.5 Northern Right Whale (*Eubalaena glacialis*)

4.2.5.1 Distribution

Historically, right whales ranged across the entire North Pacific north of 35º N latitude. Commercial whalers hunted right whales nearly to extinction during the 1800s. Before this exploitation, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, southcentral Bering Sea, Sea of Okhotsk, and the Sea of Japan (Braham and Rice 1984). Sightings have been reported as far south as Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the subarctic waters of the Bering Sea and Sea of Okhotsk in the summer (Herman et al. 1980; Berzin and Dorshenko 1982; NMFS 1991b).

4.2.5.2 Life History

Northern right whales are baleen whales that can grow up to 50 feet in length. These large, slow-swimming whales tend to congregate in coastal waters. Little is known about the life history of the right whale. No calving grounds have ever been found in the eastern North Pacific (Scarff 1986). Consequently, right whales are thought to calve in southern coastal waters of their distribution during the winter months (Scarff 1986). Scarff (1986) hypothesized that right whales summering in the eastern North Pacific mate, calve, and overwinter in the mid-Pacific or western North Pacific. The migration patterns of the North Pacific stock are also unknown. During summer, it is assumed that right whales migrate to their feeding grounds in the higher latitudes of their range. In winter, they migrate to the more temperate waters (Braham and Rice 1984).

4.2.5.3 Diet

The diet of right whales is primarily zooplankton, calanoid copepods, and euphausiids (MMS 1996).

4.2.5.4 Population Status

Pre-exploitation abundance estimates for right whales in the North Pacific stock exceeded 11,000 individuals (NMFS 1991b). The most current population estimate of right whales is 100 to 200 individuals in the North Pacific (Wada 1973). It is unknown whether the population has increased, decreased, or remained stable since this estimate was calculated; a current reliable estimate of the abundance for the North Pacific right whale stock is not available (Hill and DeMaster 2000).

Sightings of right whales are extremely rare. From 1958 to1982 there were only 32 to 36 sightings of right whales in the central North Pacific and Bering Seas (Braham 1986). In the eastern North Pacific south of 50º N, only 29 reliable sightings were recorded between 1900 and 1994 (Scarff 1986, Scarff 1991, Carretta et al. 1994). In 1996 a right whale was sighted off Maui (Hill and DeMaster 2000) and a group of 3 to 4 right whales were sighted in Bristol Bay. This latter group was thought to include a juvenile (Goddard and Rugh 1998). In 1997, a group of 5 to 9 individuals was seen in approximately the same Bristol Bay location (Hill and DeMaster 2000).

#### 4.2.5.5 Critical Habitat

Little information exists on the natural history of right whales. Consequently, the location and type of critical habitat for right whales is unknown due to the rarity of this species.

#### 4.2.5.6 Factors Affecting Survival

Due to the lack of information on right whales and their rarity, the factors that affect the survival of right whales are not known. Consequently, the annual estimated rate of human-caused mortality and serious injury is thought to be minimal for this stock and there are no known habitat issues of concern (Hill and DeMaster 2000).

### 4.2.6 Cetacean of Special Concern – Beluga Whale (*Delphinapterus leucas*)

#### 4.2.6.1 Distribution

The beluga whale is a long-lived, medium-sized, toothed cetacean (ADFG 1999). Beluga whales are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich 1980). Based on mitochondrial analysis, five separate stocks of belugas are recognized in Alaskan waters: 1) Cook Inlet, 2) Bristol Bay, 3) Eastern Bering Sea, 4) Eastern Chukchi Sea, and 5) Beaufort Sea (Hill and DeMaster 2000).

#### 4.2.6.2 Life History

Adult belugas are sexually dimorphic with males ranging from 11 to 15 feet and weighing between 1,000 and 2,000 pounds (ADFG 1999). Adult females are smaller, averaging slightly more than 10 feet (Morris 1992), but usually less than 12 feet (ADFG 1999). They have a blubber layer which can be 5 inches thick (ADFG 1999) and are the only species of whale that can bend its neck, which is thought to be an adaptation to maneuvering and catching prey in silty, ice-covered waters (ADFG 1999). This species is unique, being the only known whale species that molts its skin on an annual basis (Huntington et al. 1999).

Information on breeding and reproduction specific to the Cook Inlet belugas is generally lacking. However, some information can be inferred from studies of other parts of the beluga range. The average age at sexual maturity is estimated to be 5 or 6 years and breeding takes place triennially in early spring (Calkins 1989; ADFG 1999). Breeding can occur as early as February, but generally occurs from March through April (Morris 1992; ADFG 1999). Gestation is estimated between 14 and 15 months with calving occurring from May through July (ADFG 1999). Belugas usually give birth to one calf at a time. The lactation period of these mammals has been estimated at between one and two years with an average of 23 months (Morris 1992). Calves may begin to take their first prey between months 12 and 18 while continuing to nurse (Morris 1992). Calves normally take smaller prey, such as shrimp, when they begin to forage for themselves (Morris 1992).

#### 4.2.6.3 Diet

Beluga whales feed seasonally on a variety of fishes, shrimps, squids, and octopus (Burns et al., 1985). Fish species that belugas feed on during the summer include salmon, herring, eulachon (*Thaleichthys pacificus*), capelin, smelt, and arctic cod (*Boregadus saida*) (Calkins 1989). Pacific tomcod (*Microgadus proximus*) may be an important food source for Cook Inlet belugas in autumn and winter when salmon and eulachon are not available (Calkins 1989).

Large groups of belugas congregate at river mouths in the upper drainages of Cook Inlet to feed on migrating prey species, such as the eulachon and salmon (Morris 1992). Belugas generally feed in the upper 30 feet of the water column (Morris 1992), with most feeding dives are thought to be between depths of 20 and 100 feet and to last 2 to 5 minutes (ADFG 1999).

#### 4.2.6.4 Predation

The killer whale is the beluga whale's only natural predator. Killer whales are common visitors to Cook Inlet and have been known to pursue belugas in the Inlet (M. Eagleton, NMFS, pers. comm.).

#### 4.2.6.5 Population Status

Due to their population decline, the Cook Inlet stock of beluga whales was listed as depleted under the Marine Mammal Protection Act (MMPA) on May 31, 2000 (65 FR 105; 50 CFR 216.15). Upon further investigation, on June 22, 2000, NMFS denied a petition to list the Cook Inlet stock of belugas as endangered (65 FR 21).

Estimates of the world beluga population range between 40,000 and 55,000, while current estimates in Alaska and western Canadian Beaufort Sea stock range between 21,000 and 39,258 individuals (Duval 1993; Harwood et al. 1996).

Beluga surveys in Cook Inlet have concentrated on the upper inlet during periods when belugas congregate at the mouths of the rivers for calving or feeding (Morris 1992). Whales can only be counted as they surface because of the turbid water in upper Cook Inlet. Therefore, the population estimate is based on assumptions of the numbers of unseen animals. The Cook Inlet stock was first surveyed in 1964 and 1965 by the Alaska Department of Fish and Game (ADFG). The ADFG estimated a minimum of 300 to 400 whales sighted (Calkins 1989). In 1979, 1982, and 1983, Calkins performed extensive aerial surveys of the inlet and reported sighting as many as 479 in 1979 (Morris 1992). However, Calkins (1989) did not survey to estimate the abundance of beluga whales in the entire Cook Inlet region

A multi-year study supported by the National Marine Mammal Laboratory, which began in 1993, reported that virtually all sightings were within one kilometer of shore in upper Cook Inlet (Withrow et al. 1994). Surveys between 1994 and 1999 produced abundance estimates of 653, 491, 594, 440, 347, and 357 whales, respectively (65 FR 105). These numbers suggested a more than 40 percent drop in population size over the last 6 years. Beluga distribution data also suggest a reduction in offshore sightings in both upper and lower Cook Inlet (Rugh et al. 2000).

There were 184 individuals during the 2000 Cook Inlet beluga whale surveys (Rugh et al. 2000). This was the lowest median raw count (the number of whales actually observed and not corrected for missed whales) of belugas since NMFS initiated Cook Inlet beluga surveys. These statistics raise concern about the long-term health and viability of the Cook Inlet stock.

#### 4.2.6.6 Habitat

Belugas are sighted most often in coastal and continental shelf waters. They frequent bays, estuaries and river mouths (Sheldon 1993). The immensity of Cook Inlet and its high productivity provide ideal habitat for the Cook Inlet stock of belugas. The shallow, upper inlet is demarcated by the Forelands which constrict the flow of water into and out of the upper inlet (Sheldon 1993), thus providing warmer waters early in the spring, and may restrict beluga access during ice cover in the winter months. Tidal swirls and rips are common throughout the inlet and, coupled with the large tidal ranges, complex circulation patterns are formed particularly in the lower inlet (Sheldon 1993). These contribute to the generally ice-free status of the lower inlet in winter, providing winter habitat for the beluga stock.

Beluga whales occupy different parts of Cook Inlet in different seasons (Sheldon 1993). Belugas have been observed regularly in Cook Inlet from March through November (Morris 1992). Although the population is thought to use the lower inlet during winter months (Calkins 1989) due to ice cover in the upper inlet (Sheldon 1993), no sightings have been recorded between the months of December and February (Morris 1992), and little effort has been directed during this time of year as well. As the ice recedes in the early spring, belugas move into the upper inlet (Sheldon 1993). Concentrations occur nearshore in the northwestern upper inlet from April through June (Calkins 1989), with the largest counts of belugas during May and June (Morris 1992), particularly between West Foreland and Knik Arm (Sheldon 1993). Withrow et al. (1994) report large aggregations of up to 260 near the mouths of the rivers.

By August, beluga concentrations disperse along the coastline of the upper and central inlet. Groups of less than 10 animals dispersed along the coastline north of Kalgin Island were reported in late September (Withrow et al. 1994). With the return of ice in late fall, the population likely moves into the lower inlet (Sheldon 1993), although it appears that some belugas remain in the upper Cook Inlet during the winter if conditions are appropriate. The tracking of two satellite-tagged belugas (tracking data available at http://nmml.afsc.noaa.gov/CetaceanAssessment/BelugaTagging/2000_Folder/2000_beluga_whale_tagging.htm) during November to December 2000 indicate that these whales are spending a portion of the winter in upper Cook Inlet in Knik Arm and Chickaloon Bay (NMFS 2000b).

#### 4.2.6.7 Factors Affecting Survival

The principal disturbances to beluga distribution are reported to include: 1) commercial fishing, 2) industrial development, 3) proximity to human settlement, and 4) hunting.

Current data on mortality and serious injury from fishery-related activities are not available for the Cook Inlet stock of beluga whales. It is currently thought that commercial fisheries in Cook Inlet have little, if any, interaction with belugas. In Cook Inlet, belugas may contact purse seines, drift gillnets, and set gillnets. Between 1981 and 1983 in Cook Inlet, an estimated 3 to 6 belugas per year were killed from interactions with fishing gear (Burns and Seaman 1986). Self-reports of beluga mortalities from commercial fishermen throughout the 1990s were considered incomplete and unreliable (Hill and DeMaster 2000). Since 1999, observers have been used to document beluga mortalities from the Cook Inlet gillnet fisheries. No beluga mortalities have been observed during the observer program (Hill and DeMaster 2000).

In Cook Inlet, over 50 percent of the human population lives on or near the shoreline of the beluga summer range (Morris 1992). Industrialization and increased size of human settlement bring a host of potential disturbances. Most industries and municipalities discharge wastewater to the inlet. Cook Inlet supports 13 offshore oil production platforms, one onshore petroleum refinery and one natural gas facility, which are serviced by large tankers (Morris 1992). Belugas may habituate to the routine noises of the platform operations, but may avoid the noise of the tankers, particularly in summer (Huntington et al. 1999). Frost and Lowry (1990) indicate that aircraft noise can also influence whale distribution and behavior. When aircraft fly below an altitude of about 300 feet, belugas have been observed to swim rapidly away from the source (Withrow et al. 1994). Municipalities, as well as the industries that discharge to the inlet, provide various levels of wastewater treatment, which may or may not remove contaminants that impact the beluga population.

The decline of Cook Inlet belugas has been primarily attributed to subsistence harvest by Alaska Natives. Mean annual subsistence take of beluga whales from the Cook Inlet stock averaged 87 whales between 1993 and 1997. Currently, there is a moratorium on harvesting Cook Inlet belugas. Future harvest levels have yet to be determined. Because of extremely low population numbers, cumulative harvest over years will affect the recovery rate of the Cook Inlet population. During 1998, local Alaska Native organizations and NMFS began to formalize a specific agreement for management of the Cook Inlet beluga stock; however, no formal agreement has yet been signed.

# 5.0 IMPACTS OF THE PROPOSED ACTION

In the analysis of the possible impacts of wastewater discharge from Forest Oil's Osprey Platform in the Redoubt Shoal Development Area, all direct, indirect, and cumulative impacts on threatened and endangered species or their critical habitat were assessed. The following were specifically considered:

- the proximity of the action to the species and the critical habitat,
- the distribution of where the actions may occur,
- the timing of the action and its relationship to sensitive periods in the life cycle of the various endangered species,
- the nature of the action and its associated effects,
- the duration of the action and its associated effects, and
- if impacts were associated with an action, the frequency, intensity, and severity of the impacts.

## 5.1 DEFINITION OF THE ACTION AREA

The action area for this project is the water immediately around Forest Oil's Osprey Platform, in the Forelands area of central Cook Inlet, Alaska (60° 41' 46" N latitude and 151° 40' 10' W longitude) [Figure 2]. The platform is located 1.8 miles southeast of the tip of the West Foreland, Alaska.

## 5.2 POTENTIAL IMPACTS ON BIRDS

### 5.2.1 Steller's eider

#### 5.2.1.1 <u>Abundance, Distribution and Habitat Use in Project and Action Area</u>

Few Steller's eiders are expected to occur within the action area. The action area for the offshore Osprey Platform, situated on the western side of Cook Inlet, is not located within preferred habitat or proposed critical Steller's eider habitat. Currently, portions of lower Cook Inlet on the eastern side (Kachemak Bay, north to Ninilchik) and the western side (the marine waters from Chinitna Point south to Cape Douglas) are proposed as critical wintering habitat for Steller's eiders. Eiders may occur in the project area as occasional visitors during the winter months.

Little information exists on the abundance and distribution of Steller's eiders in the West Foreland area of lower Cook Inlet. Steller's eiders have wintered in Kachemak Bay and further north along the eastern side of Cook Inlet (Balogh 1999). This area is considered critical wintering habitat for Steller's eiders. Balogh (1999) also indicated that no Steller's eiders have been observed near the project area in recent years, but that a limited number of eider surveys have been conducted on the western side of Cook Inlet. The most recent observations of Steller's eiders in Cook Inlet reported approximately 1,000 Steller's eiders south of Ninilchik in

1999 (T. Antrobus, USFWS, pers. comm.). In 1997, 650 individuals were seen in the same area near Ninilchik. USFWS plans to conduct Steller's eiders surveys during early 2001 to ascertain abundance and distribution of Steller's eiders in Cook Inlet.

#### 5.2.1.2 Timing of Habitat Use in the Action Area

Steller's eiders can be present in lower Cook Inlet during the winter months (Balogh 1999). On the eastern side of the Kodiak Archipelago, peak observation of eiders occurred in December, although eiders were present from October through March (ENRI 1998; Wilbor and Tande 1998). Numbers decline as winter progresses and eiders begin their northern migration to staging/feeding and eventually nesting grounds (King and Lanctot 2000). It is thought that some sub-adults may remain on wintering grounds or along the migration route during the summer breeding season (65 FR 49), although this has not been documented in Cook Inlet.

#### 5.2.1.3 Direct Impacts

Production at the Osprey Platform will increase wastewater discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry; Section 2.2) into Cook Inlet. These permitted discharges are typically low volumes of clean freshwater or seawater, which contain small amounts of added substances. Exposure to this discharge is the primary concern for Steller's eider.

The Osprey Platform will discharge its operational wastewaters on site, outside of any critical habitat for Steller's eiders. No concentrations of eiders are expected in the project area. Steller's eiders are only occasional winter visitors around the western side of Cook Inlet. During the winter months the amount of discharge from the Osprey Platform should be minimal and no displacement of, or direct impacts to eiders is expected from waste stream discharges.

#### 5.2.1.4 Indirect Impacts

Of the wastewater discharges (e.g. deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry), sanitary waste is the most likely to create an indirect impact to Steller's eiders. The low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production, although the impact will probably be negligible. The total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. Other discharged wastewaters will comply with water quality standards for the state of Alaska (18 AAC.70). There should be no indirect adverse impacts to Steller's eiders from the discharge of wastewaters from the Osprey Platform.

#### 5.2.1.5 Cumulative Impacts

Cumulative impacts of discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry) from the Osprey Platform should have negligible effects for Steller's eider. The volume of discharge appears to be minimal as stated under Forest Oil's NPDES permit application. In addition, wastewater discharges of similar quality from other oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities are released into Cook Inlet as well. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are minimal. All contaminants of concern will be discharged at concentrations that meet the water quality criteria and the requirements of the NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999). Once released, the strong tidal fluxes associated with Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, there would be no cumulative impacts to Steller's eiders expected to occur from the discharges associated with the Osprey Platform.

#### 5.2.1.6 Conclusions

Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller's eiders, nor is the action likely to adversely affect or jeopardize the threatened Alaska nesting population or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller's eiders or their proposed critical habitat.

### 5.2.2 Short-tailed Albatross

Annual observations of the short-tailed albatross, a pelagic seabird, have been recorded in the Gulf of Alaska and the North Pacific since 1947. The short-tailed albatross has not been observed in the coastal waters of Cook Inlet since observations began (1947 through 1999) (AKNHP 2000; IPHC 1999). Therefore, wastewater discharges associated with the offshore Osprey Platform will not likely have any direct, indirect, or cumulative impacts on the short-tailed albatross. Neither will it jeopardize the recovery of this species.

## 5.3 POTENTIAL IMPACTS ON MARINE MAMMALS

### 5.3.1 Steller sea lion

#### 5.3.1.1 Abundance, Distribution and Use of Habitat in the Project and Action Area

Although no rookeries or haul-out sites have been identified in the immediate project or action area, Steller sea lions may range and forage throughout Cook Inlet during salmon runs (Smith 1999). For example, one male Steller sea lion was observed at the mouth of the Susitna River (M. Eagleton, NMFS, pers. comm.). However, only a small number of animals are present at any particular time and they would not be present in any concentrations in the Redoubt Shoals area (Smith and Mahoney 1999). The nearest reported Steller sea lion rookery is the Sugarloaf Islands rookery located in the Barren Islands (58º 53.0" N, 152º 2.0" W) approximately 12 miles from the West Foreland (NMFS 2000c). The nearest major Steller sea lion haul-out is located on Ushagat Island (58º 55.0" N, 152º 22.0" W).

#### 5.3.1.2 Direct Impacts

Although Steller sea lions can occur in the project area, wastewaters from the Osprey Platform (e.g. deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry) will be discharged outside of designated Stellar sea lion critical habitat and should not impact Steller sea lion marine habitat in the West Foreland area. It is possible that a small number of Steller sea lions could be present in the West Foreland area during the summer months, but it is unlikely that the discharges offshore would disturb them. Discharges will be diluted by the strong tidal flux of Cook Inlet. Any disturbance that might occur would be very short-term and unlikely to adversely affect Steller sea lions.

#### 5.3.1.3 Indirect Impacts

Of the wastewater discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry), sanitary waste is the most likely to create any indirect impact to Steller's sea lions. The low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production, but these effects will probably be negligible. The total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. All of the wastewater discharges will comply with water quality standards for the state of Alaska (18 AAC.70). No indirect impacts for Steller sea lions are anticipated from the discharge of wastewaters from the Osprey Platform.

#### 5.3.1.4 Cumulative Impacts

Cumulative impacts of discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry) from the Osprey Platform should have negligible effects for the Steller sea lion. The volume of discharges appear to be minimal as stated under Forest Oil's NPDES permit application. In addition, wastewater discharges of similar quality from other oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities, are released into Cook Inlet as well. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are minimal. All contaminants of concern will be discharged at concentrations that meet the water quality criteria and the requirements of the NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999). Once released, the strong tidal fluxes associated with Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, there would be no cumulative impacts to Steller sea lion expected to occur from the discharges associated the Osprey Platform.

#### 5.3.1.5 Conclusions

Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller sea lions, nor is the action likely to adversely affect or jeopardize the threatened Alaska population or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller sea lions or their proposed critical habitat.

### 5.3.2 Endangered Cetaceans

All of the endangered whale species being considered in this biological assessment (the humpback, fin, blue, and northern right whales) will be discussed as a group for simplicity. The impacts of the proposed action will be similar for all of the species concerned.

#### 5.3.2.1 Abundance, Distribution and Use of Habitat in the Project and Action Area

The four whale species could be present in the lower Cook Inlet area and any observations would most likely be located near the entrance to Cook Inlet (Smith 1999). Most documentation of larger whales in Cook Inlet comes from historic records, mainly strandings (M. Eagleton, NMFS, pers. comm.). Historic data suggests that small numbers of humpback and fin whales have been observed in portions of lower Cook Inlet on occasion during the summer months and have been documented within one mile from shore (MMS 1996). Furthermore, humpback and fin whales would not be found regularly above Kachemak Bay (Smith and Mahoney 1999). During the summer of 2000, humpbacks were observed around the entrance of Cook Inlet, near the Barren Islands. Blue and northern right whales would be only accidental visitors in lower Cook Inlet. The project and action areas are located outside of critical habitat for all of the endangered whale species.

#### 5.3.2.2 Direct Impacts

Wastewaters from the Osprey Platform in Cook Inlet (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry) will be discharged outside of critical and high use habitat for the humpback, fin, blue, and northern right whales. In general, humpback and fin whales are not present in the Forest Oil project area and no impacts are anticipated. Wastewater discharges would not likely influence marine habitat for whales in Cook Inlet either. Although the platform will be operated year-round, activities and sightings of these larger whales in Cook Inlet and the Gulf of Alaska waters would generally occur during the summer months. Thus, in the event that individual whales migrate into Cook Inlet waters, it is unlikely that wastewater discharges from the platform would disturb them. Any disturbance that did occur would be very short-term and unlikely to adversely affect the animals.

#### 5.3.2.3 Indirect Impacts

Of the wastewater discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry), sanitary waste is the most likely to create any indirect impact to humpback, fin, blue, and northern right whales. The low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production but will probably have a negligible effect. The total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet the water quality criteria designed to protect both human health and aquatic life. Other discharged wastewaters will also comply with water quality standards for the state of Alaska (18 AAC.70). There will be no indirect adverse impacts to humpback, fin, blue, and northern right whales from the discharge of wastewater from the Osprey Platform.

5.3.2.4 Cumulative Impacts

Cumulative impacts of discharges (e.g. deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry) from the Osprey Platform should have negligible effects for humpback, fin, blue, and northern right whales. The volume of discharges appear to be minimal as stated under Forest Oil's NPDES permit application. In addition, wastewater discharges of similar quality from other oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities are released into Cook Inlet as well. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are minimal. All contaminants of concern are discharged at concentrations that meet the water quality criteria and the requirements of the NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999). Once released, the strong tidal fluxes in Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, there would be no cumulative impacts to endangered whales expected to occur from the discharges associated the Osprey Platform.

5.3.2.5 Conclusions

Discharges from Forest Oil's Osprey Platform in the Redoubt Shoal Development Area is not likely to directly or indirectly impact any of the four endangered whale species (humpback, fin, blue, or northern right whales), nor is the action likely to adversely affect or jeopardize the endangered Alaska populations or their critical habitat. The proposed actions also will not have incremental effects resulting in a cumulative effect on these species.

### 5.3.3 Beluga Whale

5.3.3.1 Abundance, Distribution and Use of Habitat in the Project and Action Area

Little is known of the habitat use of beluga whales in Cook Inlet. Although beluga whales use portions of Cook Inlet throughout the year, the Forelands area is a natural travel corridor between upper Cook Inlet and lower Cook Inlet where belugas pass (NMFS 2000b). The project area is not heavily used by belugas and the Kustatan River does not appear to be as important to belugas as other rivers (Smith and Mahoney 1999), such as the Susitna, the Little Susitna, and Beluga rivers where large concentrations of belugas are present during the summer (NCG 1999).

Beluga whales can be present in the tidal rips near the West Foreland, but these are usually further offshore than the project area (Smith 1999).

#### 5.3.3.2 Direct Impacts

Impacts on beluga whales associated with production activities at the Osprey Platform will be limited to increased exposure to wastewater discharges (e.g. deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry). Discharges will be diluted by the strong tidal flux of Cook Inlet.

Wastewater will be discharged from the Osprey Platform outside areas in Cook Inlet where large concentrations of belugas are present during the summer (NMFS 2000d). Although the platform will be operated year-round, the West Foreland is not heavily used by beluga whales (Smith and Mahoney 1999). It is unlikely that wastewater discharges from the Osprey Platform would affect belugas or their marine habitat. Any impacts from the wastewater discharges would be very short-term and unlikely to adversely affect the whales.

#### 5.3.3.3 Indirect Impacts

Of the wastewater discharges (deck drainage, sanitary wastes, domestic wastes, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry), sanitary waste is the most likely to create any indirect impact to beluga whales. The low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production but will probably have a negligible effect. The total residual chlorine (the only toxic contaminant of concern) in the sanitary wastewater will be discharged at concentrations that meet the water quality criteria designed to protect both human health and aquatic life. Other discharged wastewaters will also comply with water quality standards for the state of Alaska (18 AAC.70). There will be no indirect adverse impacts to beluga whales from the discharge of wastewater from the Osprey Platform.

#### 5.3.3.4 Cumulative Impacts

Cumulative impacts of discharges from the Osprey Platform should have negligible effects for beluga whales. The volume of the discharges appears to be minimal as stated under Forest Oil's NPDES permit application. In addition, wastewater discharges of similar quality from other oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities are released into Cook Inlet as well. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are minimal. All contaminants of concern will be discharged at concentrations that meet the water quality criteria and the requirements of the NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999). Once released, the strong tidal fluxes associated with Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, no cumulative impacts to beluga whales are expected to occur from the discharges associated with the Osprey Platform.

#### 5.3.3.5 Conclusions

Wastewater discharges from Forest Oil's Osprey Platform in the Redoubt Shoal Development Area is not likely to directly or indirectly impact Cook Inlet beluga whales, nor is the discharge likely to adversely affect or jeopardize the Cook Inlet population or their critical habitat. The proposed actions also should not have incremental effects resulting in a cumulative effect to these species.

### 5.4 SUMMARY FINDING

Based on the Cook Inlet tidal flux, the anticipated volume of wastewater discharge, and Osprey Platform's contribution to the cumulative loading of waste discharges in Cook Inlet, this Biological Assessment concludes that wastewater discharges from the Osprey Platform will be rapidly diluted and will likely have no adverse effect on the marine mammal and bird species listed in this assessment or critical habitat associated with these species.

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# APPENDIX A

# CORRESPONDENCE WITH NMFS AND USFWS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services Anchorage
605 West 4th Avenue, Room 62
Anchorage, Alaska 99501-2249



IN REPLY REFER TO:
WAES

January 12, 2000

Matt Harrington
Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

RE: Request for Threatened and Endangered Species List, Forcenergy National Pollutant Discharge Elimination System Permit, Kustatan, Alaska

Dear Mr. Harrington:

On January 7, 2000, we received your request for a list of Federal threatened and endangered species that may occur in the vicinity of the proposed project, Kustatan, Alaska. Therefore, we are providing a list of potential listed species per section 7 of the Endangered Species Act of 1973, as amended. The following species are anticipated to occur in the action area:

| | | |
|---|---|---|
| Steller's eider | (*Polysticta stelleri*) | T |
| Short-tailed albatross | (*Phoebastria albatrus*) | E(PE) |

This letter relates only to endangered species under our jurisdiction. It does not address species under the jurisdiction of the National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Clean Water Act, or National Environmental Policy Act. Therefore, compliance with other environmental regulations may be appropriate.

If you have any questions regarding this letter please contact me at (907) 271-2781; Fax: (907) 271-2786; e-mail: arthur_davenport@fws.gov.

Sincerely,

Arthur E. Davenport

Arthur E. Davenport
Endangered Species Biologist

UNITED STATES DEPARTMENT OF COMMERC
National Oceanic and Atmospheric Administration
*National Marine Fisheries Service*
*P.O. Box 21668*
*Juneau, Alaska 99802-1668*

February 14, 2000



Mr. Matt Harrington
Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

Re: Forcenergy

Dear Mr. Harrington:

Thank you for your letter requesting information on endangered, threatened, or any species of special concern under National Marine Fisheries Service (NMFS) jurisdiction. NMFS offers the following information for your review.

Marine mammals that regularly occur inside Cook Inlet include the western population of Steller sea lion, harbor seal, harbor porpoise, killer whale, and beluga whale. Marine mammals that are occasionally found in lower Cook Inlet waters include the humpback, gray, minke, and fin whales. Of these marine mammals, the Steller sea lion, fin whale, and humpback whale are listed as an endangered species under the Endangered Species Act (ESA). Given their distribution and limited seasonal occurrence in the inlet, none of the ESA listed species should be adversely impacted by your project. Further, critical habitat for the above listed species has not been identified within Cook Inlet or your project area.

The beluga whale is presently listed as a candidate species under the ESA and is proposed as a depleted stock under the Marine Mammal Protection Act (MMPA). We have identified the Cook Inlet beluga whale as a species of special concern and one which we believe justifies specific measures to protect. We offer the following information specific to the beluga whale stock found within Cook Inlet.

The distribution of beluga whales in Cook Inlet based on annual aerial surveys has indicated that all of Cook Inlet is occupied at one time or another throughout the year with major concentrations at the mouths of several anadromous fish streams and rivers such as the McArthur, Kustatan and Drift Rivers. The clustered distribution of the whales at the rivers, the physical characteristics and limited number of large rivers in the inlet, and the availability of concentrated food sources at the mouths of these rivers suggest that these areas provide habitat necessary to the well-being of the beluga.

The beluga whale can be very sensitive to disturbance, and we have often observed pronounced avoidance reactions to surface and in-water noise. Any activity that might disturb or cause these whales to abandon important feeding or calving areas could have adverse and significant consequences and would likely be in violation of the MMPA.

Please direct any further questions or concerns you may have especially regarding Cook Inlet beluga whales to our Anchorage Field Office at (907) 271-5006.

Sincerely,

Donald J. Berg

For Steven Pennoyer
Administrator, Alaska Region

cc: USFWS, EPA(Rockwell), ADEC(McGee), ADFG, ADGC - Anchorage
Cook Inlet Marine Mammal Council

Matthew.Eagleton@noaa.gov
08/28/2000 11:29 AM

To: Matthew Harrington/R10/USEPA/US

cc: fen5@pcbox.alaska.net, Arthur_Davenport@fws.gov, wintersr@orcalink.com

Subject: Re: esa and efh for force energy

---

I am not sure if this will help, but may. ESA and EFH are consultations between agencies unless otherwise delegated by the federal agency.

Some differences between ESA and EFH:

ESA:

Federal action agency requests a list from NMFS or other for which T&E species may be found in/near the action along with brief description of the action.

EPA determines no effect or may effect. If no effect, then done. Also, if no adverse effect and want NMFS to concur with this, then we can and have in the past done this.

If a may effect, then BA (or similar) discusses action, determines whether or not there is an adverse effect, and is sent to NMFS or other. However, if BA determines an adverse effect, then we step into a more formal process which may lead to a NMFS Biological Opinion (BO). However, it gets a little "gray" if NMFS disagrees with a no adverse effect determination. In this case, NMFS would probably ask for some discussion with the action agency.

EFH:

Federal action agency investigates which EFH species are in/near action and determines if there may be an adverse effect to EFH (no species list request). If federal action determines no effect, then no EFH Assessment needs to prepared by action agency.

If there is an adverse effect then the EFH Assessment is submitted to NMFS. An EFH Assessment can either be a separate stand alone or folded into environmental document. If copmpleted alone, it must contain the requirements in 50 CFR Part 600. If folded, then it must be referenced as such and contain all the requirements. NMFS must review and offer any EFH Conservation Recommendations to lessen impact. if needed. However, if the action agency determines no effect and NMFS learns of the action through other means, such as a public notice, and feels the action may adversely effect EFH, then NMFS is required to offer EFH Conserve Rec's anyway.

I suspect EPA has determined there may be some effect or a BA would not be at this stage. I agree it would be best to list your determinations for ESA and EFH in whatever NEPA document you prepare. NMFS will review, offer comment and rec's and concur/not concur where needed. Most documents label the ESA sections, I suggest to clearly label the EFH section also.

I apologize if my above review is a repeat, but I feel it helps see the difference between the ESA and EFH. Please let me know if there are any questions.

ATTN: Matthew Harrington

The following preliminary information is per your telephone request regarding Threatened and Endangered species in the vicinity of the Force Energy project in Cook Inlet. The National Marine Fisheries Service (NMFS) is responsible for the administration of the Endangered Species Act (ESA) as it applies to certain cetaceans and pinnipeds in Alaska and the Magnuson Stevens Fisheries Conservation and Management Act as it applies to Essential Fish Habitat (EFH).

Marine Mammals

Marine mammals that range throughout the Gulf of Alaska, including Cook Inlet waters, include the Steller sea lion, harbor seal, Dall's and harbor porpoise, and minke, beluga, killer, humpback, fin, blue, and right whale.

Candidate Species

The Cook Inlet population of beluga whale is currently listed as a candidate species under the ESA.

Endangered Species

Endangered marine mammal species are as follows: fin, right, humpback, blue, sperm, sei, and bowhead whales and the western stock of the northern Steller sea lion (west of 144 degrees longitude). Humpback and fin whales are occasionally sighted offshore during summer months, and have been documented within one-mile of shore. Also, few (and rare) sightings of fin, blue, and right whales in the northern Gulf of Alaska have been reported. Steller sea lions may forage and transit waters of Cook Inlet during peak salmon returns. The closest listed Steller sea lion rookery is in the Barren Islands, specifically the Sugarloaf Islands Rookery at 58 53.0 N, 152 02.0 W. The closest major Steller sea loin haulout is the Ushagat Island Haulout at 58 55.0 N,152 22.0 W.

Essential Fish Habitat

Additionally, NMFS is responsible for provisions regarding Essential Fish Habitat (EFH) within the administration of the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. 1801 et seq.). The MSFCMA states that each federal agency shall consult with NMFS with respect to any federal action authorized, funded, undertaken, or proposed by such agency that may adversely affect EFH. Therefore, your review should also include an EFH assessment as required by the MSFCMA and detailed in 50 CFR Part 600.920 (g). Please visit our website for specific information such as EFH species habitat associations, EFH species maps, and the EFH Environmental Assessment at http://www.fakr.noaa.gov/habitat.

Please call Matthew P. Eagleton in the NMFS Anchorage field office at (907) 271-6354 for any questions.

# APPENDIX C

# ESSENTIAL FISH HABITAT ASSESSMENT

# Essential Fish Habitat Assessment for Wastewater Discharges Associated with the Osprey Platform in the Redoubt Shoal Unit Development Project

# Cook Inlet, Alaska

Submitted to
Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Submitted by
Science Applications International Corporation
18706 North Creek Parkway, Suite 110
Bothell, WA 98011

March 16, 2001

Contract No. 68-W7-0050, Delivery Order 2004
SAIC Project No. 06-5050-01-9695-005

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# 1.0 INTRODUCTION

The Clean Water Act , PL-92-500, as amended, authorizes the U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates discharges from point sources to waters of the United States. While the majority of states are currently authorized to administer the NPDES program, the State of Alaska is not among them. Thus, EPA regulates the point source discharges in the state by issuing NPDES permits.

The 1996 amendments to the Magnuson-Stevens Act, PL-104-267, which regulate fishing in U.S. waters, included substantial new provisions to protect important habitats for all federally managed species of marine and anadromous fish. The amendment created a new requirement to describe and identify "essential fish habitat" (EFH) in each fishery management plan. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." All federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on all actions undertaken by the agency that may adversely affect EFH.

Forest Oil (formerly Forcenergy Inc.) has proposed the development of a new oil and gas project in the waters of Cook Inlet, Alaska to access reserves in the Redoubt Shoal Unit. As a result of the development, Forest Oil is proposing to convert the offshore Osprey Platform from a manned exploratory platform to a production platform. Forest Oil has applied to EPA for an NPDES permit for the discharge of wastewater from the Osprey Platform in Cook Inlet, Alaska. These discharges include deck drainage, sanitary wastewater, domestic wastewater (gray water), boiler blowdown, fire control system test water, and non-contact cooling water.

This document provides an assessment of the impacts of the wastewater discharges on the essential fish habitat of the federally managed species in the vicinity of the discharge in Cook Inlet, Alaska. This document is prepared and submitted in compliance with the consultation requirements of the 1996 amendments to the Magnuson-Stevens Act.

# 2.0 DESCRIPTION OF THE PROPOSED ACTION

The Osprey Platform, by design, is a movable drilling platform that has been constructed to support exploration and eventually production drilling operations for the Redoubt Shoal Unit (Figure 1). The platform was placed onsite during late June 2000, approximately 1.8 miles southeast of the end of the West Foreland (Latitude 60º 41’ 46” N, Longitude 151º 40’ 10” W) (Figure 2). The West Foreland is considered the northernmost boundary of lower Cook Inlet. The platform is approximately 12 miles northwest of Kenai, Alaska and approximately 70 miles southwest of Anchorage, Alaska. The water depth at the platform is approximately 45 feet (referenced to mean lower low water). The platform is designed to handle anticipated oceanographic, meteorological, and seismic design conditions for the area.

At the completion of exploration drilling operations, which are currently being conducted under the general NPDES permit for Oil and Gas Exploration (AKG285024), the Osprey Platform will be used to either support offshore production operations (as addressed in this document) or be removed if oil and gas are not found in commercial quantities. Platform conversion would include the addition of limited production equipment and the installation of offshore pipelines and utility lines.

If the platform is not converted to production, wells will be plugged, abandoned, the piling and conductors will be cut, and the platform floated off-location (similar to the manner in which it was floated on-location). These operations would be conducted in accordance with applicable regulations and with appropriate approvals from the Alaska Oil and Gas Conservation Commission (AOGCC), the Alaska Department of Natural Resources (ADNR), and the Minerals Management Service (MMS).

## 2.1 LOCATION OF THE PROPOSED ACTION

The action area for this project is Forest Oil’s Osprey Platform in the Forelands area of central Cook Inlet, Alaska (60º 41’ 46” N latitude and 151º 40’ 10” W longitude) (Figure 2). The platform is located 1.8 miles southeast of the tip of the West Foreland, Alaska.

## 2.2 PRODUCTION ACTIVITIES

### 2.2.1 Completion

After confirmation of a successfully producing formation, the well will be prepared for hydrocarbon extraction, or “completion.” The completion process includes: setting and cementing of the production casing; packing the well; and installing the production tubing. During the completion process, equipment is installed in the well that allows hydrocarbons to be extracted from the reservoir. Completion methods are determined based on the type of producing formation, such as hard or loose sand, and consist of four steps: wellbore flush, production tubing installation, casing perforation, and wellhead installation.

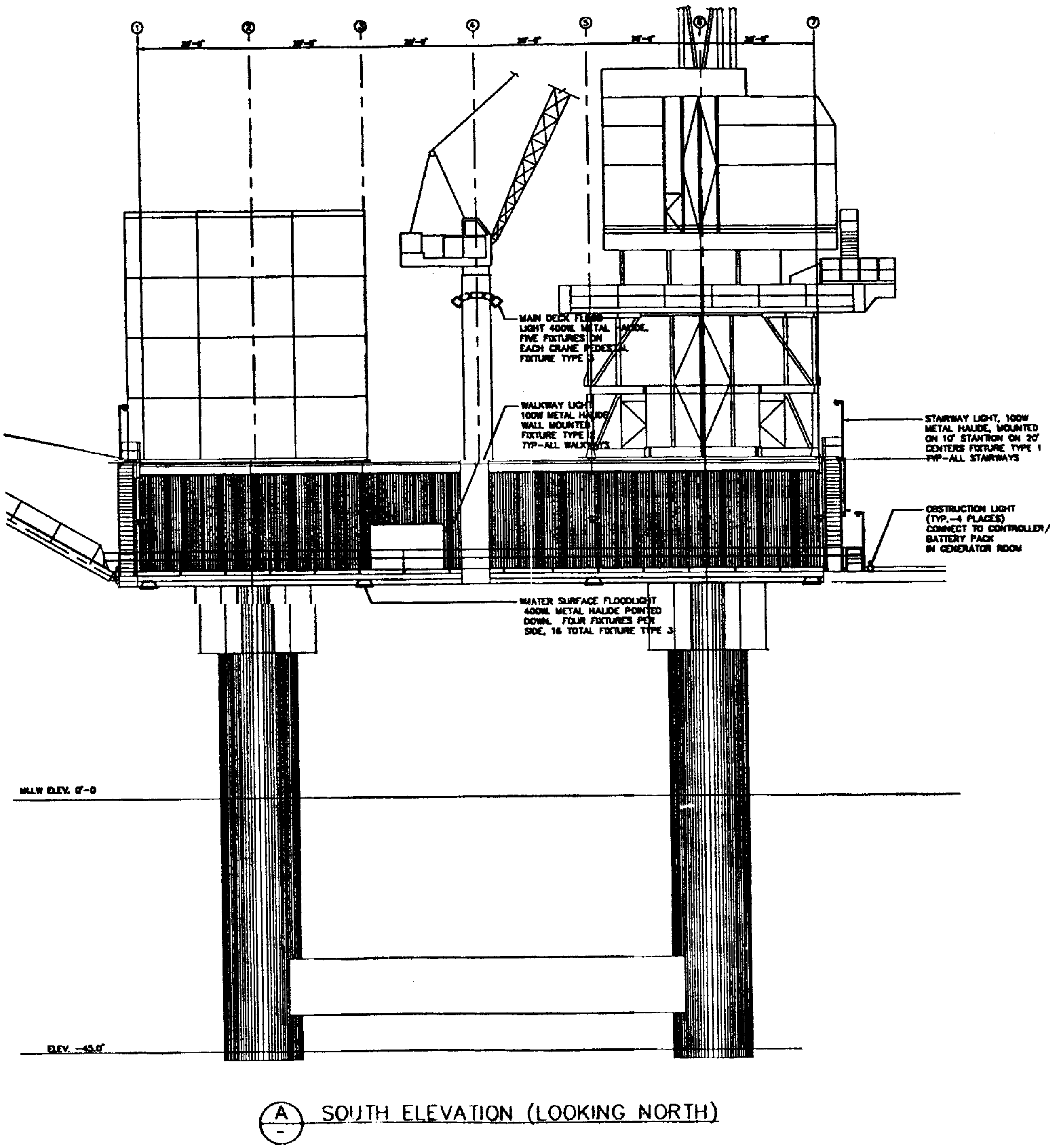


**Figure 1. General Schematic of Osprey Offshore Drilling Platform**

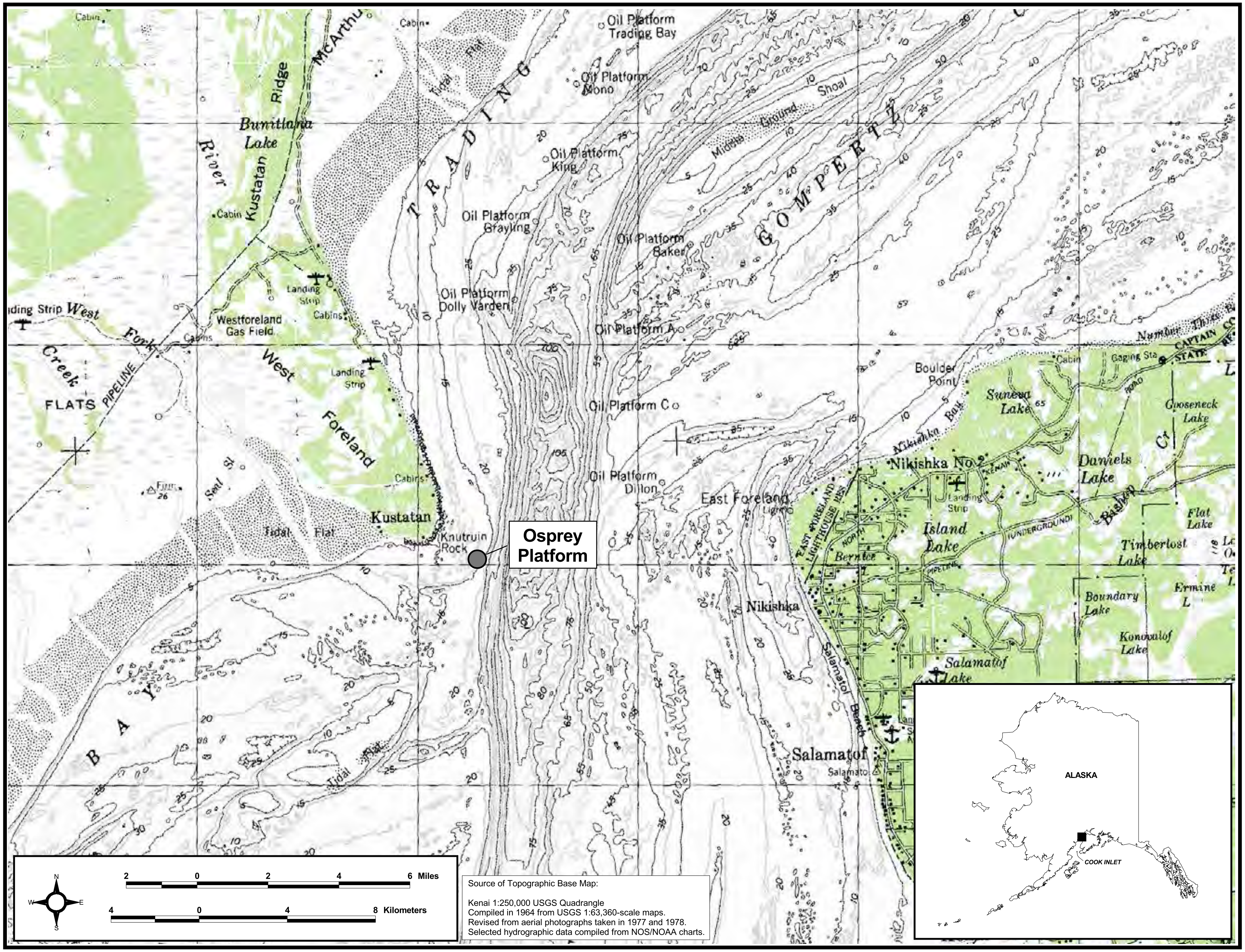


Figure 2. Location of the Osprey Platform in the Redoubt Shoal Development Area, Cook Inlet, Alaska.

### 2.2.2 Fluid Extraction

The fluid that will be produced from the oil reservoir consists of crude oil, natural gas, and produced water. Production fluids will flow to the surface, through tubing inserted within the cased borehole, using electric submersible pumps. As hydrocarbons are produced, the natural pressure in the reservoir decreases and additional pressure must be added to the reservoir to continue production of the fluids. The additional pressure will be provided artificially to the reservoir using waterflooding, which is the injection of water into the reservoir to maintain formation pressure that would otherwise drop as the withdrawal of the formation fluids continues.

### 2.2.3 Fluid Separation

As the produced fluids (natural gas, crude oil, and produced water) surface from the wells, the gas will be separated from the liquids in a two-phase separator on the platform. The wet gases from the separator will pass through a glycol dehydrator to remove water and then will be used to support platform heating or will be shipped by pipeline to the onshore production facility. The liquids will be pumped to the Wet Oil Surge Vessel and then pumped to the onshore production facility for oil-water separation. There will be no storage capacity onboard the Osprey Platform for separated liquids. The produced water separated from the crude oil at the onshore production facility will then be pumped back to the Osprey Platform by pipeline for downhole injection to maintain formation pressures within the Redoubt Shoal Unit.

### 2.2.4 Well Treatment

Well treatment is the process of stimulating a producing well to improve oil or gas productivity. It is not anticipated that stimulation will be needed for the wells. However, if well treatment is required at the Osprey Platform, the method used will be acid treatment. Acid stimulation is performed by injecting acid solutions into the formation. The acid solution dissolves portions of the formation rock, thus enlarging the openings in the formation. The acid solution must be water soluble, safe to handle, inhibited to minimize damage to the well casing and piping, and inexpensive.

### 2.2.5 Workover

Workovers or treatment jobs occur approximately once per year. Workover operations are performed on a well to improve or restore productivity, repair or replace downhole equipment, evaluate the formation, or abandon the well. Workover operations include well pulling, stimulation (acidizing and fracturing), washout, reperforating, reconditioning, gravel packing, casing repair, and replacement of subsurface equipment. The four general classifications of workover operations are pump, wireline, concentric, and conventional. Workovers can be performed using the original derrick. The operations begin by using a workover fluid to force the production fluids back into the formation, to prevent them from exiting the well during the operation.

### 2.2.6 Well Drilling

Rotary drilling is the process that is used to drill the well. The rotary drill consists of a drill bit attached to the end of a drill pipe. The most significant waste streams, in terms of volume and constituents associated with the drilling activities, are drilling fluids and drill cuttings. Drill cuttings are particles (e.g., sand, gravel, etc.) generated by drilling into subsurface geological formations and carried to the surface with the drilling fluid. The drilling fluid, or mud, is a mixture of water, special clays, and certain minerals and chemicals used to cool and lubricate the bit, stabilize the walls of the borehole, and maintain equilibrium between the borehole and the formation pressure. The drilling fluid is pumped downhole through the drill string and is ejected through the nozzles in the drill bit and then circulated to the surface through the annulus. The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

## 2.3 WASTE STREAMS ASSOCIATED WITH THE PROPOSED ACTIVITY

The Final NPDES General Permit for Oil and Gas Exploration, Development, and Production Facilities in Cook Inlet, Alaska (AKG285000) identified 19 waste streams. According to Forest Oil's Environmental Information Document (NCG 2001), the following waste streams will not be generated at the Osprey Platform: desalination unit wastes (Discharge No. 005); uncontaminated ballast water (Discharge No. 010); bilge water (Discharge No. 011), and muds, cuttings, cement at seafloor (Discharge No. 013). The remaining waste streams are discussed in the following sections.

### 2.3.1 Drilling Fluids (Discharge No. 001)

Drilling fluids are the circulating fluids (muds) used in the rotary drilling of wells to clean and condition the hole, to counterbalance formation pressure, and to transport drill cuttings to the surface. A water-based drilling fluid is the conventional drilling mud in which water is the continuous phase and the suspending medium for solids, whether or not oil is present. An oil-based drilling fluid has diesel, mineral, or some other oil as its continuous phase with water as the dispersed phase. Production drilling operations onboard the Osprey Platform will use a combination of both freshwater-based and oil-based drilling fluids. The freshwater-based drilling fluids will typically be used for the upper 2,500 feet of the well and the oil-based drilling fluids will be used for depths below 2,500 feet (NCG 2001). The drilling fluids will be separated from the drill cuttings on the platform for use as make-up drilling fluids.

### 2.3.2 Drill Cuttings (Discharge No. 001)

Drill cuttings are the particles generated by drilling into subsurface geologic formations and carried to the surface with the drilling fluid. The separated drill cuttings will be disposed of in a Class II injection well that has been permitted with the Alaska Oil and Gas Conservation Commission (AOGCC).

### 2.3.3 Dewatering Effluent (Discharge No. 001)

Dewatering effluent is wastewater from drilling fluid and drill cutting dewatering activities. The dewatering effluent will be disposed of with the separated drill cuttings into a Class II injection well that has been permitted with the AOGCC.

### 2.3.4 Deck Drainage (Discharge No. 002)

Deck drainage refers to any waste resulting from platform washing, deck washing, spillage, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. This could also include pollutants, such as detergents used in platform and equipment washing, oil, grease, and drilling fluids spilled during normal operations (Avanti 1992). On the Osprey Platform, contaminated deck drainage will be treated through an oil-water separator prior to discharge (Amundsen 2000a). Non-contaminated deck drainage will be discharged with no treatment. The average flow of deck drainage from the platform will be 108,000 gallons per day (NCG 2001), depending on precipitation. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70.020).

### 2.3.5 Sanitary Waste (Discharge No. 003)

Sanitary waste is human body waste discharged from toilets and urinals. The sanitary waste system on the Osprey Platform, an aerated marine sanitation device, will serve a 3- to 55-person crew residing on the platform at any one time. The expected maximum quantity of sanitary waste discharged is 2,020 gallons per day (United Industries Group 1998 and NCG 2001). The pollutants associated with this discharge include suspended solids, 5-day biochemical oxygen demand ($BOD_5$), fecal coliform, and residual chlorine. All sanitary discharges will be in accordance with the appropriate water quality standards and effluent treatability requirements for the state of Alaska (18 AAC 70, 18 AAC 72, and 40 CFR 133.105).

### 2.3.6 Domestic Waste (Discharge No. 004)

Domestic waste (gray water) refers to materials discharged from sinks, showers, laundries, safety showers, eyewash stations, and galleys. Gray water can include kitchen solids, detergents, cleansers, oil and grease. Domestic waste will not be treated prior to discharge. The expected quantity of domestic waste discharged is 4,000 gallons per day (NCG 2001). All domestic discharges will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.3.7 Blowout Preventer Fluid (Discharge No. 006)

Blowout preventer fluid is hydraulic fluid used in blowout preventer stacks during well drilling. According to Forest Oil’s Environmental Information Document (NCG 2001), blowout preventer fluid will not be discharged from the Osprey Platform.

### 2.3.8 Boiler Blowdown (Discharge No. 007)

Boiler blowdown is the discharge of water and minerals drained from boiler drums to minimize solids build-up in the boiler. Boiler blowdown discharges are "not planned or likely, but possible to occur intermittently" (Amundsen 2000a). The expected quantity of boiler blowdown is 100 gallons per event. Boiler blowdown will be treated through an oil-water separator prior to discharge (Amundsen 2000a). This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.3.9 Fire Control System Test Water (Discharge No. 008)

Fire control system test water is sea water that is released during the training of personnel in fire protection, and the testing and maintenance of fire protection equipment on the platform. This discharge is intermittent, and is expected to occur approximately 12 times per year. The expected quantity of fire control system test water is 750 gallons per minute for 30 minutes, for a total discharge per event of 22,500 gallons. Contaminated fire control system test water will be treated through an oil-water separator prior to discharge. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.3.10 Non-Contact Cooling Water (Discharge No. 009)

Non-contact cooling water is sea water that is used for non-contact, once-through cooling of various pieces of machinery on the platform. The expected quantity of non-contact cooling water is 300,000 gallons per day. This discharge will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC.70).

### 2.3.11 Excess Cement Slurry (Discharge No. 012)

Excess cement slurry will result from equipment washdown after cementing operations. This waste stream will be discharged intermittently while drilling, depending on drilling, casing, and testing program/problems (Amundsen 2000a). Approximately 30 discharge events are anticipated per year, with a maximum discharge of 100 bbl per event. Excess cement slurry will not be treated prior to discharge. Discharge of this waste stream will be in accordance with the appropriate water quality standards for the state of Alaska (18 AAC 70).

### 2.3.12 Waterflooding Discharges (Discharge No. 014)

Waterflooding discharges are discharges associated with the treatment of seawater prior to its injection into a hydrocarbon-bearing formation to improve the flow of hydrocarbons from production wells, and prior to its use in operating physical/chemical treatment units for sanitary waste. These discharges include strainer and filter backwash water. All waterflooding discharges will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.13 Produced Water (Discharge No. 015)

Produced water refers to the water (brine) brought up from the hydrocarbon-bearing strata during the extraction of oil and gas, and can include formation water, injection water, and any chemicals added downhole or during the oil/water separation process. The produced water will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.14 Well Completion Fluids (Discharge No. 016)

Well completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the well bore during operations which prepare the drilled well for hydrocarbon production. The well completion fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.15 Workover Fluids (Discharge No. 017)

Workover fluids are salt solutions, weighted brines, polymers, or other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures. The workover fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.16 Well Treatment Fluids (Discharge No. 018)

Well treatment fluid refers to any fluid used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled. The well treatment fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.17 Test Fluids (Discharge No. 019)

Test fluids are discharges that occur if hydrocarbons located during exploratory drilling are tested for formation pressure and content. This would consist of fluids sent downhole during testing, along with water from the formation. The test fluids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

### 2.3.18 Produced Solids (Discharge No. 021)

Produced solids are sands and other solids deposited from produced water which collect in vessels and lines and which must be removed to maintain adequate vessel and line capacities. The produced solids will be disposed of in a Class II injection well that has been permitted with the AOGCC.

## 3.0 DESCRIPTION OF PROJECT AREA

The Cook Inlet basin is an elongated depression of the earth's crust between two major parallel mountain ranges, the Kenai Range in the southeast and the Alaska Range to the northwest. The basin is underlain by thick sedimentary deposits that exceed 30,000 feet in some places (Wilson and Torum 1968). Sedimentary rocks, such as conglomerates, sandstones, siltstones, limestone, chert, volcanics, and clastics make up the Cook Inlet basin.

Plate movement was responsible for creating the basin and mountain ranges. Several major glaciations have altered the landscape of the region. During the Pleistocene age, glaciers pushed beyond the mountain fronts into the lowlands, depositing sediment and debris up to several thousand feet thick. As the glaciers receded, Cook Inlet assumed its present form (USCOE 1993). Active volcanoes and earthquakes are common to the area as well (USCOE 1993).

Sea floor soils in upper Cook Inlet typically consist of silts, sands, gravels, cobbles, and boulders. Underlying soils are generally glacial till with occasional bedrock outcrops. Beaches surrounding the inlet may also be covered by glacial silts and muds. Most of the sea floor is covered by a gravel, cobble, and boulder armor layer as a result of the high tidal currents. Other features of high current regimes, including sand and gravel waves, are also common in the upper inlet.

Cook Inlet is characterized by extreme tidal fluctuations of up to 12.2 meters that produce strong currents in excess of eight knots (Tarbox and Thorne 1996). Tides wash in and out of the Cook Inlet basin like a very long wave. Fluid motion on this large scale is affected by the rotation of the earth, causing incoming currents in Cook Inlet to veer toward the east coast and outgoing currents to veer to the west coast. Tidal ranges on the east shore are generally larger than ranges on the western shore because incoming currents have more energy. In the deeper, broader areas of the lower Inlet, the tidal current changes directions in an elliptical pattern, known as rotary tides.

Water quality in upper Cook Inlet is influenced by the high currents and large volumes of seasonally varying freshwater inflows. The high tidal currents tend to keep the entire water column well mixed and little vertical stratification is present except near the mouths of major rivers. Large, glacier-fed rivers, such as the Susitna and Knik rivers, which flow into the inlet, contribute large amounts of freshwater and suspended sediments.

The climate of the central Cook Inlet region is transitional between maritime and continental regimes. Regional topography and water bodies heavily influence area climate. The Kenai Mountains to the south and east act as a barrier to warm, moist air from the Gulf of Alaska. Cook Inlet precipitation averages less than 20 percent of that measured on the Gulf of Alaska side of the Kenai Mountains. The Alaska Range to the north provides a barrier to the cold winter air masses that dominate the Alaska Interior. Cook Inlet waters tend to moderate temperatures in the area. Occasionally, short periods of extreme cold and/or high winds occur when strong pressure gradients force cold air southward from the Interior.

## 4.0 IDENTIFICATION OF SPECIES

To initiate the preparation of the EFH Assessment, those species whose habitat may be affected by the proposed action were identified. The action under consideration in this assessment is the issuance of a permit to Forest Oil to discharge wastewater to Cook Inlet from the Osprey Platform during production operations. The Environmental Assessment for Essential Fish Habitat (NPFMC 1999) and the Essential Fish Habitat Assessment Reports (NMFS 1998a-e) were used for the identification of species. These documents identify EFH species relative to the location of proposed actions and describe the general distribution of the species life stages.

Based on a review of the documents identified above and the location of the Forest Oil Osprey Platform, a list of EFH species was generated (Table 1); the habitat occupied by each species life stage was also identified. While only a few of the species listed in Table 1 are depicted on maps as having adult and/or late juvenile distributions in the vicinity of the discharge, discussions with NMFS indicate a broader interpretation of the distributions. For example, NMFS prepared the following paragraph for an action in Cook Inlet:

> *"The Sustainable Fisheries Act of 1996 amends the Magnuson Act of 1976, now renamed to the Magnuson-Stevens Act of 1996 (MSA), to include provisions related to fishery habitat. One such provision is the definition of Essential Fish Habitat (EFH). The MSA mandates each Regional Fishery Management Council to amend their Fishery Management Plans (FMP) to include a description of EFH for all life stages of an FMP species. EFH has been broadly defined by MSA to include 'those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.' Groundfish and anadromous species that range throughout the Gulf of Alaska which include Cook Inlet waters are: walleye pollock, pacific cod, deepwater flatfish (dover sole), shallow water complex (yellowfin sole, rock sole) rex sole, flathead sole, arrowtooth flounder, sablefish, pacific ocean perch, slope rockfish (shortraker, rougheye, northern ), pelagic rockfish (dusky), yelloweye rockfish, thornyhead rockfish, atka mackerel, skates, sculpins, shark, squid, octopus, forage fish (eulachon, capelin, sand lance, myctophid and bathylagids, sand fish, euphausids, pholids, stichaeid, gonostomatids) and five Pacific salmon stocks (chinook, chum, coho, pink sockeye)."*

As indicated in Table 1, a total of 35 species were identified as EFH species: five species of salmon, two groundfish, two shallow water flatfish, 18 other fish species, and eight species from the forage fish complex. Of the salmonids, only late juvenile and adult stages utilize the habitat of Cook Inlet, and then predominantly during migration. Of the 35 species, eight are associated with soft muddy or sandy bottoms, unlike those found at the site. Many of the species are benthic or demersal in water of substantially greater depths than the 45 feet (13.6 meters) in which the platform is located and therefore are not likely to be exposed to the discharge from the platform. Table 2 provides information on the prey of the EFH species. As will be discussed in Section 5.0, the wastewater discharges are not anticipated to have any direct or indirect adverse impacts on prey near the Osprey Platform.

**Table 1 (Page 1 of 4)**
**Essential Fish Habitat Species in the Vicinity of Osprey Platform, Cook Inlet, Alaska**

| Common Name | Habitat | | | | Comments |
|---|---|---|---|---|---|
| | Eggs | Larvae | Juvenile | Adult | |
| Salmon | | | | | |
| Pink salmon | freshwater, < 2mm diameter gravel | < 15% fines | IT to P < 50m | P < 200m | Eggs/larvae in freshwater only. Juvenile and adult habitats in marine areas only. |
| Chum salmon | freshwater, < 2mm diameter gravel | < 15% fines | IT to P < 50m | P < 200m | Eggs/larvae in freshwater only. Juvenile and adult habitats in marine areas only. |
| Sockeye salmon | freshwater, < 2mm diameter gravel | < 15% fines | IT to P < 50m | P < 200m | Eggs/larvae in freshwater only. Juvenile and adult habitats in marine areas only. |
| Chinook salmon | freshwater, < 2mm diameter gravel | < 15% fines | IT to P < 50m | P < 200m | Eggs/larvae in freshwater only. Juvenile and adult habitats in marine areas only. |
| Coho salmon | freshwater, < 2mm diameter gravel | < 15% fines | IT to P < 50m | P < 200m | Eggs/larvae in freshwater only. Juvenile and adult habitats in marine areas only. |
| Groundfish | | | | | |
| Walleye pollock | P | EP | P | P 70-200m | Adults associated with fronts and upwelling. |
| Pacific cod | D 40-265m | EP | MC | MC up to 500m | Juveniles and adults in areas of mud, sandy mud, muddy sand, and in the lower portion of the water column. |
| Shallow Water Flatfish | | | | | |
| Rock sole | D 125-250m, areas of pebble, sand | P, upper 30m | D < 250m | D < 250m | All stages, excluding larval, found in areas of pebbles and sand. |
| Yellowfin sole | P, inshore waters | P, inshore waters | B down to 250m, areas of sandy bottom | B down to 250m, areas of sandy bottom | Adults migrate to deeper waters in the winter. |
| Other Fish Species | | | | | |
| Rex sole | P nearshore and offshore | P offshore | D > 300m | D > 300m | Juveniles and adults in areas of gravel, sand, and mud in the lower portion of the water column. |

**Table 1 (Page 2 of 4)**
**Essential Fish Habitat Species in the Vicinity of Osprey Platform, Cook Inlet, Alaska**

| Common Name | Habitat | | | | Comments |
|---|---|---|---|---|---|
| | Eggs | Larvae | Juvenile | Adult | |
| Flathead sole | P | P | D < 300m | D < 300m | Juveniles and adults in areas of sand and mud in the lower portion of the water column. |
| Arrowtooth flounder | P | P | D 50-500m | D 50-500m | Juveniles and adults in areas of gravel, mud, and sand in the lower portion of the water column. |
| Black cod (Sablefish) | P 200-3000m | D to P | P > 100m areas of soft bottom | P > 200m areas of soft bottom | Juveniles and adults associated with deep shelf gullies and fjords. |
| Pacific ocean perch | V | P | P to D | D 180-420m | Juveniles and adults associated with areas of cobble, gravel, mud, sandy mud, and muddy sand. |
| Shortraker rockfish | V | P | shallower than adults | D 200-500m | Adults associated with mud, sand, rock, sandy mud, cobble, muddy sand, and gravel. |
| Rougheye rockfish | V | P | shallower than adults | D 200-500m | Adults associated with mud, sand, rock, sandy mud, cobble, muddy sand, and gravel. |
| Northern rockfish | V | P | P | MC to D | Juveniles and adults associated with areas of cobble and rock. |
| Dusky rockfish | V | P | P | MC to D < 50m | Juveniles and adults associated with areas of cobble, rock, and gravel. |
| Yelloweye rockfish | V | EP | D | D | Juveniles and adults associated with areas of rock and coral along nearshore bays and island passages. |
| Thornyhead rockfish | P gel coated egg sac floats to the surface | P | D | D | Juveniles and adults associated with areas of mud, sand, rock, sandy mud, cobble, muddy sand, and gravel. |
| Atka mackerel | shallow water, gravel, rock, kelp | EP | NI | entire water column, gravel, rock, kelp | Perform diurnal/tidal movements between D and P areas. |

**Table 1 (Page 3 of 4)**
**Essential Fish Habitat Species in the Vicinity of Osprey Platform, Cook Inlet, Alaska**

| Common Name | Habitat | | | | Comments |
|---|---|---|---|---|---|
| | Eggs | Larvae | Juvenile | Adult | |
| Capelin | IT | EP | P | P | Eggs associated with sand and cobble intertidal beaches down to 10m depth. Adults associated with intertidal beaches of sand and cobble down to 10m depth during spawning. |
| Sculpins | all substrates, rocky, shallow waters | P | D | D | Juveniles and adults associated with a broad range of demersal habitats from intertidal pools, all shelf substrates and rocky areas |
| Skates | egg cases on bottom of adult habitat, all substrates | N/A | D | D | Juveniles and adults associated with a broad range of substrate types (mud, sand, gravel, and rock). |
| Red Squid | B | N/A | P | P | Eggs associated with areas of mud and sand. |
| Octopus | B all substrates | N/A | D | D down to 500m | Juveniles and adults associated with a broad range of substrate types, including rocky shores and tidepools. |
| Sharks | NI | N/A | all waters and substrates | all waters and substrates | |
| Forage Fish Complex | | | | | |
| Eulachon | eggs deposited in rivers | P | P | P | Eggs on bottom substrates of sand, gravel and cobble in rivers during April-June. Adults in rivers during spawning. |
| Sand lance | B | P and surface | entire water column, over soft bottom | entire water column | Adults associated with soft bottom substrates (sand, mud). |

**Table 1 (Page 4 of 4)**
**Essential Fish Habitat Species in the Vicinity of Osprey Platform, Cook Inlet, Alaska**

| Common Name | Habitat | | | | Comments |
|---|---|---|---|---|---|
| | Eggs | Larvae | Juvenile | Adult | |
| Myctophids | NI | NI | P | P | Juveniles and adults associated with pelagic waters ranging from near surface to lower portion of the water column. |
| Bathylagids | NI | NI | P | P | Juveniles and adults associated with pelagic waters ranging from near surface to lower portion of the water column. |
| Sand fish | B nearshore | NI | B | B | Juveniles and adults associated with bottom substrates of mud and sand. |
| Euphausiids | surface | EP | P | P | Juveniles and adults associated with upwelling, or nutrient-rich areas. |
| Pholids | NI | NI | IT to D, KEB | IT to D, KEB | Certain species associated with vegetation such as eelgrass and kelp. |
| Stichaeids | NI | NI | IT to D, KEB | IT to D, KEB | Certain species associated with vegetation such as eelgrass and kelp. |

**Notes:**

B - Benthic
D - Demersal
EP - Epipelagic
IT - Intertidal or tidepools
KEB - Associated with kelp or eelgrass beds
MB - Mesobenthal (just above the bottom)
MC - Midcolumn
P - Pelagic
NI - No information
V - Viviparous, young released as larvae

**Sources:**

NPFMC 1999
NPFMC Web Site

**Table 2 (Page 1 of 2)**
**Prey Species Associated with EFH Species**

| Common Name | Prey Species |
|---|---|
| Salmon | |
| Pink salmon | J: planktivore; A: piscivore (herring, anchovies, sand lance, surf smelt) |
| Chum salmon | J: planktivore; A: piscivore (herring, anchovies, sand lance, surf smelt) |
| Sockeye salmon | J: planktivore; A: piscivore (herring, anchovies, sand lance, surf smelt) |
| Chinook salmon | J: planktivore; A: piscivore (herring, anchovies, sand lance, surf smelt) |
| Coho salmon | J: planktivore; A: piscivore (herring, anchovies, sand lance, surf smelt) |
| Groundfish | |
| Walleye pollock | J: crustaceans, copepods, and euphausiids; A: crustaceans, copepods, and ephausiids |
| Pacific cod | J: mysids, euphausiids, and shrimp; A: pollock, flatfish, and crab |
| Shallow Water Flatfish | |
| Rock sole | J: polychaetes, bivalves, amphipods, and crustaceans; A: polychaetes, bivalves, amphipods, and crustaceans |
| Yellowfin sole | J: polychaetes, bivalves, amphipods, and echiurids; A: polychaetes, bivalves, amphipods, and echiurids |
| Other Fish Species | |
| Rex sole | J: polychaetes, amphipods, euphausiids, and Tanner crab; A: polychaetes, amphipods, euphausiids, and Tanner crab |
| Flathead sole | J: polychaetes, bivalves, ophiuroids, pollock, small Tanner crab; A: polychaetes, bivalves, ophiuroids, pollock, small Tanner crab, and other small invertebrates |
| Arrowtooth flounder | J: euphausiids, crustaceans, amphipods, and pollock; A: euphausiids, crustaceans, amphipods, and pollock |
| Black cod (Sablefish) | J: mesopelagic and benthic fishes, benthic invertebrates, and jellyfish; A: mesopelagic and benthic fishes, benthic invertebrates and jellyfish; a large portion of the adult diet is comprised of gadid fishes, mainly pollock |
| Pacific ocean perch | J: euphausiids; A: euphausiids |
| Shortraker rockfish | J: NI; A: shrimps, squid, and myctophids |
| Rougheye rockfish | J: NI; A: shrimps, squid, and myctophids |
| Northern rockfish | NI |
| Dusky rockfish | A: euphausiids |
| Yelloweye rockfish | A: fish, shrimp and crab |
| Thornyhead rockfish | A: shrimp, fish (cottids), and small crabs |
| Atka mackerel | A: copepods, euphausiids, and meso-pelagic fish (myctophids) |
| Capelin | NI |
| Sculpins | NI |
| Skates | NI |
| Red squid | J: euphausiids, shrimp, forage fish, and other cephalopods; A: euphausiids, shrimp, forage fish, and other cephalopods |
| Octopus | J: crustaceans and mollusks; A: crustaceans and mollusks |

**Table 2 (Page 2 of 2)**
**Prey Species Associated with EFH Species**

| Common Name | Prey Species |
|---|---|
| Sharks | NI |
| Forage Fish Complex | |
| Eulachon | A: euphausiids and copepods |
| Sand lance | J: zooplankton, calanoid copepods, mysid shrimps, crustacean larvae, gammarid amphipods, and chaetognaths; A: zooplankton, calanoid copepods, mysid shrimps, crustacean larvae, gammarid amphipods, and chaetognaths |
| Myctophids | NI |
| Bathylagids | NI |
| Sand fish | NI |
| Euphausiids | NI |
| Pholids | NI |
| Stichaeids | NI |

**Notes:**
NI - No information
J - Juvenile
A - Adult

**Table 3**
**Characteristics of Sanitary Discharge from Osprey Platform and Water Quality Criteria**

| Parameter | Maximum Concentration | Water Quality Criterion |
|---|---|---|
| Biochemical Oxygen Demand (BOD) | 30 mg/L (a) | Surface dissolved oxygen may not be less than 6.0 mg/L |
| Total Suspended Solids | 50 mg/L (b) | No measurable increase in settleable solids concentration above natural conditions |
| Fecal coliform | none (a) | 14 FC/100 mL in one sample, and no more than 10% of the samples may exceed a median of 43 FC/100 mL |
| Total Residual Chlorine | 2 ug/L (a) | 2 ug/L |

(a) Amundsen 2000b
(b) United Industries Group 1998

# 5.0 ANALYSIS OF EFFECTS OF PROPOSED ACTION

Exploration drilling activities are currently being conducted at the Osprey Platform in Cook Inlet, under the general NPDES permit for Oil and Gas Exploration (AKG285024), to determine the magnitude of potential hydrocarbon reserves. Once a hydrocarbon reserve has been discovered and delineated, the Osprey Platform will be converted into an oil and gas production platform and development drilling will commence. Production drilling will require an individual NPDES permit, since the general permit for Cook Inlet does not authorize discharges from "new sources."

As identified in Section 2.3 above, the following discharges are expected to occur from the Osprey Platform: sanitary waste, deck drainage, domestic waste, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry.

## 5.1 DIRECT IMPACTS

### 5.1 Sanitary Waste

One potential impact of the sanitary waste discharge is the possible reduction in ambient dissolved oxygen concentrations in the receiving waters when sanitary waste is discharged (Tetra Tech 1994). The dissolved oxygen standard for aquatic life is usually 6 mg/L (Jones and Stokes 1989), while the ambient dissolved oxygen in the receiving waters of Cook Inlet is assumed to be higher than 8 mg/L (EPA 1984). In an analysis of a worst case scenario, EPA (1984) concluded that the discharge of treated sewage effluent during offshore exploratory drilling should not significantly impact aquatic life when ambient dissolved oxygen concentrations are at least 1 mg/L above the dissolved oxygen standard for aquatic life of 6 mg/L. Because the sanitation device is an aerated system capable of providing a minimum of 2,100 cubic feet of air per pound of BOD, dissolved oxygen in the effluent is anticipated to meet this requirement when the system is properly operated in accordance with the operating manual (United Industries Group 1998).

The effluent is anticipated to have concentrations of total suspended solids (TSS) of less than 50 mg/L. This concentration is less than the daily maximum concentrations permitted for sanitary discharges from the oil and gas production platforms in Cook Inlet that operate under the NPDES General Permit (EPA1999). Operated properly, TSS of the Osprey Platform sanitary discharge will be less than the ambient TSS in Cook Inlet of 100 mg/L (Brandsma 1999).

The wastewater will be chlorinated to remove fecal coliform bacteria. Effluent from the clarifier will flow through a chlorinator and into a 65-gallon chlorine detention tank where chlorine will dissipate for 30 minutes to an hour. Operated in accordance with the operating manual, the chlorine will reduce the fecal coliform bacteria to levels at or below the Alaska Water Quality Standard of 14 FC/100 ml.

The NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (EPA 1999) requires a total residual chlorine concentration of at least 1 mg/L to ensure proper disinfection of the sanitary waste without causing harm to the aquatic life. In the case of the Osprey Platform sanitary waste, it appears that sodium sulfite will be used to dechlorinate the effluent in-line immediately prior to discharge (United Industries Group 1998). The sodium sulfite reacts with free and residual chlorine instantaneously, consuming a small amount of alkalinity (1.38 mg of $CaCO_3$/ml chlorine consumed) (United Industries Group 1998). The concentration of total residual chlorine in the final effluent is anticipated to be less than or equal to 2 ug/L (Amundsen 2000b). Thus the water quality standards for residual chlorine will be met at the end-of-pipe, causing no direct or indirect impacts on aquatic life.

In addition to meeting water quality standards or anticipated NPDES effluent limits, the sanitary wastewater from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions, and three orders of magnitude under more turbulent conditions. It is expected that pollutants in the sanitary waste will be dissipated to undetectable concentrations within a few feet of the discharge.

### 5.1.2 Other Waste Streams

Oil is the primary pollutant found in deck drainage, with concentrations estimated at 24 to 450 mg/L (EPA 1996). Other potential contaminants include detergents and spilled drilling fluids. Contaminated deck drainage will be treated through an oil-water separator prior to discharge and will be required to meet state water quality standards. Therefore, no direct impacts on essential fish habitat is anticipated to result from discharge of deck drainage.

Domestic waste, which may contain kitchen solids and trace amounts of detergents, cleansers, and oil and gas, does not represent a significant discharge flow. Potential effects of domestic waste discharges are difficult to determine given the absence of analytical data, but are expected to be minimal.

Non-contact cooling water is not significantly different in composition than ambient seawater, except for an elevated temperature (estimated at 62$^o$ to 84$^o$F; EPA 1996). Forest Oil's permit application indicates that non-contact cooling water will be discharged at an average temperature of less than 60$^o$F, with a maximum daily value of 70$^o$F, and therefore no environmental impacts are anticipated.

Boiler blowdown and fire control system test water are intermittent discharges that will be treated through an oil-water separator to remove oil and grease. No direct impacts on essential fish habitat are anticipated due to these discharges.

Excess cement slurry represents another intermittent discharge. This waste stream may contain up to 200,000 mg/L of total suspended solids (daily maximum). The pH may be as high as 12, with temperatures up to 80$^o$F and oil and grease up to 50 ppm (Amundsen 2000a). Although the exact composition of the cement is not documented, given the small waste volume and intermittent nature of the discharge, it is not expected to represent a significant pollution source and is not likely to result in adverse impacts.

## 5.2 INDIRECT IMPACTS

The low concentrations of BOD and nutrients in the sanitary waste discharge may stimulate primary productivity to a negligible extent and enhance zooplankton production to an even more negligible extent. There should be no indirect adverse impacts on any of the EFH species due to the waste stream discharges from the Osprey Platform. The total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life.

## 5.3 CUMULATIVE IMPACTS

Other discharges of similar quality in Cook Inlet include: sanitary, domestic, deck drainage, and other waste discharges from oil and gas platforms in Cook Inlet; and municipal waste streams from Anchorage, Homer, Kenai, and other smaller cities. Given the minimal nature of the discharges from the Osprey Platform, its contributions to the cumulative loading in Cook Inlet are anticipated to be negligible. The volume and concentration of pollutants in the discharges from the Osprey Platform are expected to be minimal. All contaminants of concern will be discharged at concentrations that meet water quality criteria and the requirements of the General Permit (EPA 1999). In addition, the strong tidal fluxes associated with Cook Inlet and the West Foreland area will disperse discharges very rapidly (Haley et al. 2000). Thus, there would be no cumulative impacts to EFH species from the discharges associated the Osprey Platform.

# 6.0 MITIGATION

The discharges will meet human health water quality criteria at the end-of-pipe. These criteria are designed to protect humans from accumulation of harmful contaminant concentrations based on consumption of fish and shellfish. The discharges will also meet the water quality criteria at the end-of-pipe for protection of aquatic life. Monitoring is anticipated to be required by the NPDES permit that will be issued for the Osprey Platform to ensure compliance with the water quality standards. No water quality-based limits are needed to provide protection to aquatic life.

Wastewater from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions and three orders of magnitude under more turbulent conditions. Therefore, the minimal concentrations of TSS and BOD that will be discharged from the sanitary wastewater stream at the Osprey Platform are anticipated to be rapidly dissipated and have no potential direct, indirect, or cumulative impacts on any of the essential fish habitats of Cook Inlet. No mitigation measures are necessary to protect EFH species.

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# APPENDIX A

# EFH ASSESSMENT CORRESPONDENCE

**Matthew.Eagleton@noaa.gov**

08/28/2000 11:29 AM

To: Matthew Harrington/R10/USEPA/US

cc: fen5@pcbox.alaska.net, Arthur_Davenport@fws.gov, wintersr@orcalink.com

Subject: Re: esa and efh for force energy

---

I am not sure if this will help, but may. ESA and EFH are consultations between agencies unless otherwise delegated by the federal agency.

Some differences between ESA and EFH:

ESA:

Federal action agency requests a list from NMFS or other for which T&E species may be found in/near the action along with brief description of the action.

EPA determines no effect or may effect. If no effect, then done. Also, if no adverse effect and want NMFS to concur with this, then we can and have in the past done this.

If a may effect, then BA (or similar) discusses action, determines whether or not there is an adverse effect, and is sent to NMFS or other. However, if BA determines an adverse effect, then we step into a more formal process which may lead to a NMFS Biological Opinion (BO). However, it gets a little "gray" if NMFS disagrees with a no adverse effect determination. In this case, NMFS would probably ask for some discussion with the action agency.

EFH:

Federal action agency investigates which EFH species are in/near action and determines if there may be an adverse effect to EFH (no species list request). If federal action determines no effect, then no EFH Assessment needs to prepared by action agency.

If there is an adverse effect then the EFH Assessment is submitted to NMFS. An EFH Assessment can either be a separate stand alone or folded into environmental document. If copmpleted alone, it must contain the requirements in 50 CFR Part 600. If folded, then it must be referenced as such and contain all the requirements. NMFS must review and offer any EFH Conservation Recommendations to lessen impact, if needed. However, if the action agency determines no effect and NMFS learns of the action through other means, such as a public notice, and feels the action may adversely effect EFH, then NMFS is required to offer EFH Conserve Rec's anyway.

I suspect EPA has determined there may be some effect or a BA would not be at this stage. I agree it would be best to list your determinations for ESA and EFH in whatever NEPA document you prepare. NMFS will review, offer comment and rec's and concur/not concur where needed. Most documents label the ESA sections, I suggest to clearly label the EFH section also.

I apologize if my above review is a repeat, but I feel it helps see the difference between the ESA and EFH. Please let me know if there are any questions.

ATTN: Matthew Harrington

The following preliminary information is per your telephone request regarding Threatened and Endangered species in the vicinity of the Force Energy project in Cook Inlet. The National Marine Fisheries Service (NMFS) is responsible for the administration of the Endangered Species Act (ESA) as it applies to certain cetaceans and pinnipeds in Alaska and the Magnuson Stevens Fisheries Conservation and Management Act as it applies to Essential Fish Habitat (EFH).

Marine Mammals

Marine mammals that range throughout the Gulf of Alaska, including Cook Inlet waters, include the Steller sea lion, harbor seal, Dall's and harbor porpoise, and minke, beluga, killer, humpback, fin, blue, and right whale.

Candidate Species

The Cook Inlet population of beluga whale is currently listed as a candidate species under the ESA.

Endangered Species

Endangered marine mammal species are as follows: fin, right, humpback, blue, sperm, sei, and bowhead whales and the western stock of the northern Steller sea lion (west of 144 degrees longitude). Humpback and fin whales are occasionally sighted offshore during summer months, and have been documented within one-mile of shore. Also, few (and rare) sightings of fin, blue, and right whales in the northern Gulf of Alaska have been reported. Steller sea lions may forage and transit waters of Cook Inlet during peak salmon returns. The closest listed Steller sea lion rookery is in the Barren Islands, specifically the Sugarloaf Islands Rookery at 58 53.0 N, 152 02.0 W. The closest major Steller sea loin haulout is the Ushagat Island Haulout at 58 55.0 N,152 22.0 W.

Essential Fish Habitat

Additionally, NMFS is responsible for provisions regarding Essential Fish Habitat (EFH) within the administration of the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. 1801 et seq.). The MSFCMA states that each federal agency shall consult with NMFS with respect to any federal action authorized, funded, undertaken, or proposed by such agency that may adversely affect EFH. Therefore, your review should also include an EFH assessment as required by the MSFCMA and detailed in 50 CFR Part 600.920 (g). Please visit our website for specific information such as EFH species habitat associations, EFH species maps, and the EFH Environmental Assessment at http://www.fakr.noaa.gov/habitat.

Please call Matthew P. Eagleton in the NMFS Anchorage field office at (907) 271-6354 for any questions.

# APPENDIX F

# OCEAN DISCHARGE CRITERIA EVALUATION

United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle, WA 98101

Alaska
Idaho
Oregon
Washington

# Ocean Discharge Criteria Evaluation for the Forest Oil Osprey Platform, Redoubt Shoal Unit Development Project

## Cook Inlet, Alaska

## NPDES Permit No. AK-053309

October 2001

Prepared by:

Science Applications International Corporation
18706 North Creek Parkway, Suite 110
Bothell, WA 98011

Contract No. 68-W7-0050, Delivery Order 2004
SAIC Project No. 01-0817-01-9695-009

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ACMP | Alaska Coastal Management Program |
| AMSA | Area Meriting Special Attention |
| AOGCC | Alaska Oil and Gas Conservation Commission |
| bbl | barrel |
| BOD | biological oxygen demand |
| CFR | Code of Federal Regulations |
| CMP | Coastal Management Plan |
| CWA | Clean Water Act |
| CZMP | Coastal Zone Management Program |
| EFH | Essential Fish Habitat |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| FC | fecal coliform |
| gpd | gallons per day |
| gpm | gallons per minute |
| HPC | Habitat of Particular Concern |
| KPB | Kenai Peninsula Borough |
| MLLW | mean lower low water |
| MMPA | Marine Mammal Protection Act |
| MSA | Magnuson-Stevens Act |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| OCS | Outer Continental Shelf |
| ODCE | Ocean Discharge Criteria Evaluation |
| ppm | parts per million |
| ppt | parts per thousand |
| TSS | total suspended solids |
| USFWS | U.S. Fish and Wildlife Service |

# 1.0 INTRODUCTION

## 1.1 PURPOSE OF EVALUATION

The U.S. Environmental Protection Agency (EPA) intends to issue a National Pollutant Discharge Elimination System (NPDES) permit for effluent discharges associated with oil and gas production activities from the Forest Oil Osprey Platform located in Cook Inlet, Alaska (Figure 1). Section 403(c) of the Clean Water Act (CWA) requires that NPDES permits for such ocean discharges be issued in compliance with U.S. EPA's Ocean Discharge Criteria for preventing unreasonable degradation of ocean waters. The purpose of this Ocean Discharge Criteria Evaluation (ODCE) report is to identify pertinent information and concerns relative to the Ocean Discharge Criteria and drilling activities associated with the Osprey Platform.

U.S. EPA's Ocean Discharge Criteria (40 CFR Part 125, Subpart M) set forth specific determinations of unreasonable degradation that must be made prior to permit issuance. "Unreasonable degradation of the marine environment" is defined (40 CFR 125.121[e]) as follows:

- Significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities,
- Threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms, or
- Loss of aesthetic, recreational, scientific, or economic values, which are unreasonable in relation to the benefit derived from the discharge.

This determination is to be made based on consideration of the following 10 criteria (40 CFR 125.122):

1. The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;
2. The potential transport of such pollutants by biological, physical, or chemical processes;
3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;
4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;
5. The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;

6. The potential impacts on human health through direct and indirect pathways;
7. Existing or potential recreational and commercial fishing, including finfishing and shellfishing;
8. Any applicable requirements of an approved Coastal Zone Management Plan;
9. Such other factors relating to the effects of the discharge as may be appropriate;
10. Marine water quality criteria developed pursuant to Section 304(a)(1).

If the Regional Administrator determines that the discharge will not cause unreasonable degradation of the marine environment, an NPDES permit may be issued. If the Regional Administrator determines that the discharge will cause unreasonable degradation of the marine environment, an NPDES permit may not be issued.

If the Regional Administrator has insufficient information to determine, prior to permit issuance, that there will be no unreasonable degradation of the marine environment, an NPDES permit will not be issued unless the Regional Administrator, on the basis of the best available information, determines that: 1) such discharge will not cause irreparable harm to the marine environment during the period in which monitoring will take place, 2) there are no reasonable alternatives to the onsite disposal of these materials, and 3) the discharge will be in compliance with certain specified permit conditions (40 CFR 125.122). "Irreparable harm" is defined as "significant undesirable effects occurring after the date of permit issuance which will not be reversed after cessation or modification of the discharge" (40 CFR 125.121[a]).

### 1.2 Scope of Evaluation

This document evaluates the impacts of waste discharges during production drilling activities as provided for by the NPDES permit proposed for the Forest Oil Osprey Platform in Cook Inlet, Alaska. The permit will authorize discharges of pollutants from facility processes, waste streams, and operations identified in the permit application. Drilling wastes, including muds, cuttings, produced water, waterflooding discharges, dewatering effluent, and other drilling fluids will be disposed of in a Class II injection well that has been permitted by the Alaska Oil and Gas Conservation Commission (AOGCC). Therefore, this ODCE focuses primarily on non-drilling waste discharges such as sanitary waste, domestic waste, deck drainage, boiler blowdown, fire control system test water, non-contact cooling water, and excess cement slurry.

Exploration drilling discharges were authorized previously under the Cook Inlet General Permit for Oil and Gas Exploration, Development, and Production Facilities (AKG 285024).

This document relies extensively on information provided in the following documents:

- *Biological Assessment for Wastewater Discharges Associated with the Osprey Platform in the Redoubt Shoal Unit Development Project* (SAIC 2001a),
- *Draft Environmental Assessment for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and Gas Development Project* (SAIC 2001b),
- *Revised Preliminary Ocean Discharge Criteria Evaluation, Gulf of Alaska-Cook Inlet, OCS Lease Sale 88 and State Lease Sales Located in Cook Inlet* (USEPA 1984), and
- *Ocean Discharge Criteria Evaluation for Cook Inlet (Oil and Gas Lease Sale 149) and Shelikof Strait* (Tetra Tech 1994).

Where appropriate, the reader will be referred to these publications for more detailed information concerning certain topics.

Forest Oil's Osprey Platform is located 1.8 miles southeast of the tip of the West Foreland (latitude 60º 41' 46" N, longitude 151º 40' 10" W) in central Cook Inlet (Figure 1); water depth at the platform is 45 feet (13.7 m) referenced to mean lower low water.

### 1.3 OVERVIEW OF REPORT

Because drilling wastes will be reinjected, this evaluation focuses on sources, fate, and potential effects of non-drilling waste discharges on various groups of aquatic life. The types and projected quantities of discharges are detailed in Section 2.0. Anticipated amounts or volumes of wastes and their approximate chemical composition are also given. Following discharge, the fate of the wastes is examined in Section 3.0, which covers dilution, dispersion, and persistence of discharged constituents in relation to influential receiving water properties, including water depth, ice coverage, currents, wind, and waves.

Before discussing potential biological and ecological effects, an overview of aquatic communities and important species is presented in Section 4.0. The means by which waste discharges could impact marine life are presented in Section 5.0. Section 6.0 summarizes the biological assessment of endangered and threatened species (SAIC 2001a) required by the Endangered Species Act (ESA). Commercial and subsistence harvests, special aquatic sites, and coastal zone management plans in the Forelands area are discussed in Sections 7.0 and 8.0. Section 9.0 discusses the compliance of expected waste discharges with EPA water quality criteria. Section 10 summarizes the findings of this report.

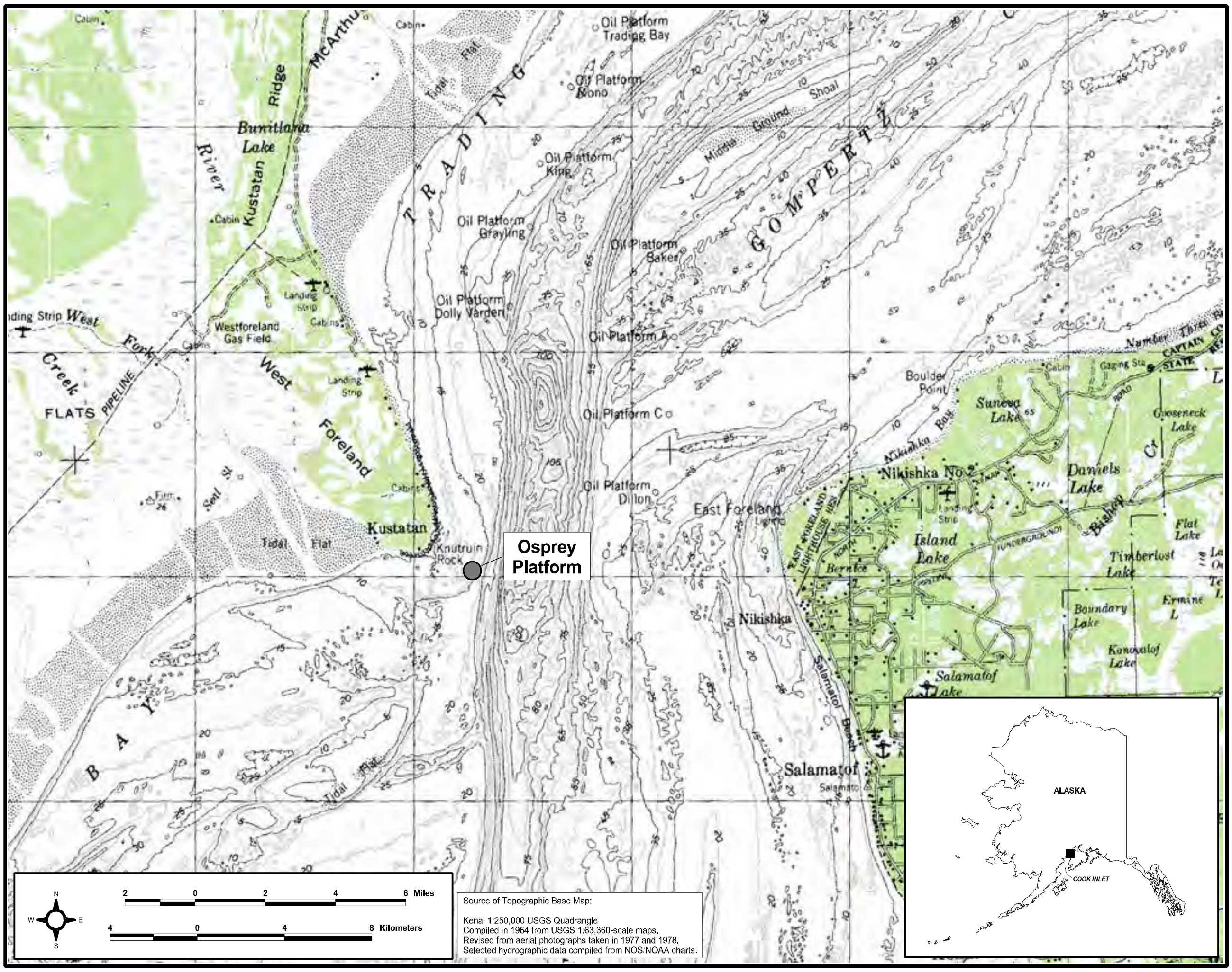


**Figure 1**
**Location of the Osprey Platform in the Redoubt Shoal Unit Development Area, Cook Inlet, Alaska**

# 2.0 COMPOSITION AND QUANTITIES OF MATERIALS DISCHARGED

## 2.1 TYPES OF DISCHARGES

Production well drilling and development can produce a wide range of waste materials related to the drilling process, maintenance of equipment, and personnel housing. Potential discharges from development and production drilling activities at the Osprey Platform include:

- drilling fluids (muds) – used in the rotary drilling of wells to clean and condition the hole, to counterbalance formation pressure, and to transport drill cuttings to the surface
- drill cuttings – the particles generated by drilling into subsurface geological formations and carried to the surface with the drilling fluid
- dewatering effluent – wastewater from drilling fluid and drill cutting dewatering activities
- waterflooding discharges – discharges associated with the treatment of seawater prior to its injection into a formation to improve the flow of hydrocarbons from production wells
- produced water – the water (brine) brought up from the hydrocarbon-bearing strata during the extraction of oil and gas
- well completion fluids – salt solutions, weighted brines, polymers, and various additives used to prevent damage to the wellbore during operations which prepare the drilled well for hydrocarbon production
- workover fluids – salt solutions, weighted brines, polymers, or other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures
- well treatment fluids – any fluid used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled
- test fluids – discharges that occur if hydrocarbons located during exploratory drilling are tested for formation pressure and content
- produced solids – sands and other solids deposited from produced water which collect in vessels and lines and which must be removed to maintain adequate vessel and line capacities.

These drilling-related wastes will not be discharged to Cook Inlet as part of the production drilling operations at the Osprey Platform. Drilling muds and cuttings will be disposed of by grinding the muds and cuttings and injecting them into a Class II injection well located beneath the Osprey Platform. This process will be continuous and will not require storage of drilling effluents onboard the platform. The injection well will be constructed, tested, and operated in accordance with approved AOGCC procedures. All drilling-related wastes described above will be reinjected.

Waste discharges that will be authorized under the proposed NPDES permit include: deck drainage; sanitary waste; domestic waste; boiler blowdown; fire control system test water; non-contact cooling water; and excess cement slurry. These waste streams and their disposition are discussed in the following sections.

## 2.2 Permitted Discharges from the Osprey Platform

The following discharges were identified on Forest Oil's NPDES permit application for the Osprey Platform (Amundsen 2000a) and will be authorized under the proposed NPDES permit. The volume, frequency, and composition of these discharges is summarized in Table 1. All waste discharges will be in accordance with the appropriate water quality standards (18 AAC 70, 18 AAC 72, 40 CFR 133.105).

### 2.2.1 Deck Drainage

Deck drainage refers to any waste resulting from platform washing, deck washing, spillage, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. This could also include pollutants, such as detergents used in platform and equipment washing, oil, grease, and drilling fluids spilled during normal operations (Avanti 1992). Oil concentrations in deck drainage are estimated at 24 to 450 mg/L (USEPA 1996). On the Osprey Platform, contaminated deck drainage will be treated through an oil-water separator prior to discharge (Amundsen 2000a). Non-contaminated deck drainage will be discharged with no treatment. The average flow of deck drainage from the platform will be 108,000 gallons per day (NCG 2001), depending on precipitation.

### 2.2.2 Sanitary Waste

Sanitary waste is human body waste discharged from toilets and urinals. The sanitary waste system on the Osprey Platform, an aerated marine sanitation device, will serve a 3- to 55-person crew residing on the platform at any one time. The expected maximum quantity of sanitary waste discharged is 2,020 gallons per day (UIG 1998 and NCG 2001). The pollutants associated with this discharge include suspended solids, 5-day biochemical oxygen demand ($BOD_5$), fecal coliform, and residual chlorine.

The effluent is anticipated to contain average concentrations of total suspended solids (TSS) of less than 50 mg/L (Amundsen 2000b). The wastewater will be chlorinated to remove fecal coliform (FC) bacteria. The effluent will be dechlorinated in-line immediately prior to discharge (UIG 1998).

### 2.2.3 Domestic Waste

Domestic waste (gray water) refers to materials discharged from sinks, showers, laundries, safety showers, eyewash stations, and galleys. Gray water can include kitchen solids, detergents, cleansers, oil and grease. Domestic waste will not be treated prior to discharge. The expected quantity of domestic waste discharged is 4,000 gallons per day (NCG 2001).

### 2.2.4 Boiler Blowdown

Boiler blowdown is the discharge of water and minerals drained from boiler drums to minimize solids build-up in the boiler. Boiler blowdown discharges are "not planned or likely, but possible to occur intermittently" (Amundsen 2000a). The expected quantity of boiler blowdown is 100 gallons per event. Boiler blowdown will be treated through an oil-water separator prior to discharge (Amundsen 2000a).

### 2.2.5 Fire Control System Test Water

Fire control system test water is sea water that is released during the training of personnel in fire protection, and the testing and maintenance of fire protection equipment on the platform. This discharge is intermittent, and is expected to occur approximately 12 times per year. The expected quantity of fire control system test water is 750 gallons per minute (gpm) for 30 minutes, for a total discharge per event of 22,500 gallons. Contaminated fire control system test water will be treated through an oil-water separator prior to discharge.

### 2.2.6 Non-Contact Cooling Water

Non-contact cooling water is sea water that is used for non-contact, once-through cooling of various pieces of machinery on the platform. The expected quantity of non-contact cooling water is 300,000 gallons per day (gpd).

Non-contact cooling water is not significantly different in composition than ambient seawater, except for an elevated temperature (estimated at 62° to 84°F; USEPA 1996). Forest Oil's permit application indicates that non-contact cooling water will be discharged at an average temperature of less than 60°F, with a maximum daily value of 70°F.

### 2.2.7 Excess Cement Slurry

Excess cement slurry will result from equipment washdown after cementing operations. Excess cement slurry will be discharged intermittently while drilling, depending on drilling, casing, and testing program/problems (Amundsen 2000a). Approximately 30 discharge events are anticipated per year, with a maximum discharge of 100 barrels (bbl), or 4,200 gallons, per event. This waste stream may contain up to 200,000 mg/L of total suspended solids (daily maximum). The pH may be as high as 12, with temperatures up to 80°F and oil and grease up to 50 parts per million (ppm; Amundsen 2000a). According to Forest Oil, excess cement slurry will not be treated prior to discharge.

## 2.3 SUMMARY

Approximately 16 wells are expected to be drilled from the Osprey Platform during the production phase of the Redoubt Shoal Unit Development Project. Each well would take about one to two months to drill (NCG 2001). Production activities are expected to continue for approximately 20 years (Amundsen 2001). Drilling wastes including muds, cuttings, and produced water will be reinjected in a Class II injection well that has been permitted with the AOGCC. Seven waste streams will be discharged to Cook Inlet waters: deck drainage, sanitary waste, domestic waste, boiler blowdown, fire control test water, non-contact cooling water, and excess cement slurry. Deck drainage and non-contact cooling water represent relatively high volume discharges (e.g., over 100,000 gpd), however pollutant concentrations in these discharges (primarily oil and grease) are predicted to be low. Discharge of sanitary wastes will result in the discharge of suspended solids, $BOD_5$, fecal coliform, and residual chlorine; however, concentrations are anticipated to be in accordance with appropriate water quality standards for the state of Alaska. The other discharges (domestic waste, boiler blowdown, fire control test water, and excess cement slurry) are low in volume or intermittent and contain minimal concentrations of contaminants.

**Table 1**
**Summary of Proposed Discharges from the Osprey Platform**

| Effluent | Volume of Discharge | Frequency of Discharge | Parameter | Maximum Daily Level | Average Daily Level |
|---|---|---|---|---|---|
| Deck Drainage | 108,000 gpd | daily | Temperature<br>Oil & Grease | <70º F<br>No Sheen | <60º F<br>No Sheen |
| Domestic Waste | 4,000 gpd | daily | | | |
| Boiler Blowdown | 100 gallons/event | weekly | | | |
| Fire Control Test Water | 22,500 gallons/event | monthly | | | |
| Non-Contact Cooling Water | 300,000 gpd | daily | | | |
| Sanitary Waste | 2,020 gpd | daily | BOD<br>TSS<br>Temperature<br>Oil & Grease<br>Total Chlorine | 60 mg/L<br>60 mg/L<br><70º F<br>No Sheen<br>>1 ppm | <60 mg/L<br><60 mg/L<br><60º F<br>No Sheen<br>>1 ppm |
| Excess Cement Slurry | 4,200 gallons/event | 30 events/year | TSS<br>Temperature<br>pH<br>Oil & Grease | <200,000 mg/L<br><80º F<br><12<br>No Sheen | <100,000 mg/L<br><60º F<br><9<br>No Sheen |

Source: NPDES Permit Application, submitted to EPA on 2/29/2000 (Amundsen 2000a)

# 3.0 Transport, Persistence, and Fate of Materials Discharged

## 3.1 Transport and Persistence

Factors influencing the transport and persistence of discharged pollutants include oceanographic characteristics of the receiving water, meteorologic conditions, characteristics of the discharge, depth of discharge, discharge rate, and method of disposal.

Transport and persistence studies conducted for Outer Continental Shelf (OCS) lease areas in high energy conditions, similar to those in Cook Inlet, are summarized in USEPA 1984. The following conclusions were made with regard to discharge of drilling muds and cuttings:

- Drilling materials discharged into the marine environment tend to be rapidly diluted and dispersed.
- Effluent concentrations may be reduced by three to five orders of magnitude within 100 m (330 feet) of the discharge point, and by five to six orders of magnitude within 800 m (2,600 feet).
- Greatest deposition usually occurs directly below or slightly downcurrent of the discharge site. The majority of sedimentation occurs within 100 m (330 feet), and background concentrations of trace metals and suspended solids are approached within 1,000 m (3,300 feet).
- Wave and current activity strongly influence surficial accumulation of pollutants.

Brandsma (1999) determined that the high suspended solids discharge of drilling muds in Cook Inlet would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions, and three orders of magnitude under more turbulent conditions.

The Osprey Platform will not discharge drilling muds and cuttings, however dilution and dispersion of sanitary and other waste streams is likely to be consistent with the above conclusions.

Detailed oceanographic data on the environment of Cook Inlet are provided in USEPA 1984, Tetra Tech 1994, and SAIC 2001a and b. Oceanographic and meteorologic conditions in the vicinity of the Osprey Platform are briefly described in the following sections. Characteristics of the discharge, including composition and discharge rate, were described in Section 2. Domestic and sanitary wastes will be discharged below the surface; no discharge will occur in water depths less than 5 m (mean lower low water).

### 3.1.1 Oceanography

Cook Inlet is a tidal estuary approximately 180 miles long and 60 miles wide at its mouth, with a general northeast-southwest orientation. It is divided naturally into the upper and lower inlet by the East and West Forelands, at which point the inlet is approximately 10 miles wide. The project area is located in the vicinity of the West Foreland (see Figure 1).

The upper Cook Inlet is typically about 17 to 19 miles wide and has relatively shallow water depths. Water depths are 100 to 200 feet (below mean lower low water-MLLW), but can exceed 500 feet in deeper channels closer to the Forelands. Water depths at the Osprey Platform location and along the proposed pipeline route are 45 feet (about 14 m below MLLW) or less.

Tides in Cook Inlet are classified as mixed, having strong diurnal and semi-diurnal components, and are characterized by two unequal high and low tides occurring over a period of approximately one day, with the mean range increasing northward (MMS 1995). Currents in the upper Cook Inlet are predominantly tidally driven. Current speeds are primarily a function of the tidal range, and their directions typically parallel the bathymetric contours. Near the mouths of major rivers, such as the Susitna River, currents may locally influence both the current speed and direction by the large volume of fresh water inflow.

Surface currents in the general vicinity of the Osprey Platform are expected to have mean peak velocities of approximately 4 knots, with flood tides flowing generally in a northeasterly direction and ebb currents flowing in a southerly direction. Surface currents along the pipeline route will have current speeds decreasing towards the landfall at the West Foreland (NCG 2001). Current directions will generally parallel the bathymetric contours. Higher peak currents may occur with high tidal ranges, and lower peak currents will occur with lower tidal ranges. Because of bottom friction, currents near the seafloor will be lower, possibly 10 percent of the surface currents within a foot of the seafloor.

Strong tidal currents also produce pronounced and persistent tidal rips at various locations in the inlet. It is believed that these features occur primarily at locations of relatively abrupt bathymetric changes. Tidal rips can be marked by surface debris and steep waves. They can also be hazardous to small boat traffic, however tidal rips would not typically be a significant problem for platform, pipeline, or rig boat operations. It has also been hypothesized that the tidal rips are important habitat to marine species. A consistent rip area occurs within a half mile east of the platform; the platform was originally sited to avoid the rip area and deeper waters to the east (NCG 2001).

A general circulation pattern is also present throughout the inlet. Limited circulation information for the upper inlet suggests that there may be a net southwesterly flow along the western side of the inlet, primarily as a result of freshwater inflows near the head of the inlet (Susitna River and from the Knik and Turnagain Arms). Below the Forelands, oceanic waters most commonly flow up the eastern side and turbid and fresher waters flow southward along the western side.

Waves in upper and central Cook Inlet are fetch and depth limited, and wave heights are usually less than 10 feet. In storms, waves in the upper inlet (Beluga area) can reach 15 feet (USCOE 1993) with wave periods estimated up to 6 to 8 seconds.

Ice is present in Cook Inlet for up to five months each year, but can vary greatly from year to year. On average, ice will be present in the inlet from late November through early April. Three forms of ice normally occur in the inlet: sea ice, beach ice, and river ice. Sea ice is the predominant type and is formed by freezing of the inlet water from the surface downward. Because of the strong tidal currents, ice does not occur as a continuous sheet but as ice pans. Pans can form up to 3 feet thick and be 1,000 feet (or greater) across. They can also form pressure ridges reportedly up to 18 feet high (Gatto 1976). Sea ice generally forms in October or November, gradually increasing from October to February from the West Foreland to Cape Douglas, and melts in March to April (Brower et al. 1988). The primary factor for sea ice formation in upper Cook Inlet is air temperature, and for lower Cook Inlet is the Alaska Coastal Current temperature and inflow rate (Poole and Hufford 1982).

Beach ice, or stamukhi, forms on tidal flats as seawater contacts cold tidal muds. The thickness of beach ice is limited only by the range of the tides and has been noted to reach 30 feet in thickness. During cold periods, beach ice normally remains on the beach; however, during warm weather in combination with high tides, it can melt free and enter the inlet. Blocks of beach ice that enter the inlet are normally relatively small (less than several tens of feet across) and have relatively low strengths.

River ice also occurs in Cook Inlet. It is a freshwater ice that is similar to sea ice except that it is relatively harder. It is often discharged into the inlet during spring breakup.

### 3.1.2 Meteorology

The climate of the central Cook Inlet area is characterized as transitional between maritime and continental regimes. Regional topography and water bodies heavily influence area climate. The Kenai Mountains to the south and east act as a barrier to warm, moist air from the Gulf of Alaska. Cook Inlet precipitation averages less than 20 percent of that measured on the Gulf of Alaska side of the Kenai Mountains (NCG 2001). The Alaska Range to the north provides a barrier to the cold winter air masses that dominate the Alaska Interior. Cook Inlet waters tend to moderate temperatures in the area. Occasionally, short periods of extreme cold and/or high winds occur when strong pressure gradients force cold air southward from the Interior.

Winds in the area are strongly influenced by mountains surrounding the Cook Inlet basin. During the months of September through April, prevailing winds are typically from the north or northwest. During May through August, winds prevail from the south. Mean speeds range from 5 knots in December to 7 knots in May (Brower et al. 1988). Site-specific, short-term data confirm the general trends described above. For example, winds measured at the West Foreland in 1999 and 2000 indicate that during September through April, prevailing winds are from the north-northeast and northeast. During June and July, winds prevail from the south-southwest and southwest. May and September are transition periods for these patterns (HCG 2000 a, b, c, d). Extreme winds are commonly out of the northeast or south.

### 3.2 Summary

The Osprey Platform is located in a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions, and three orders of magnitude under more turbulent conditions. It is expected that pollutants in the sanitary and other waste streams will be dissipated to undetectable concentrations within a few feet of the discharge.

# 4.0 COMPOSITION OF BIOLOGICAL COMMUNITIES

This section provides an overview of the biological communities found in the vicinity of the Osprey Platform in Cook Inlet. Life history and other detailed information on plankton, benthos, fish, mammals, and birds in the area is provided in *Biological Assessment for Wastewater Discharges Associated with the Osprey Platform in the Redoubt Shoal Unit Development Project* (SAIC 2001a) and *Draft Environmental Assessment for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and Gas Development Project, Cook Inlet, Alaska* (SAIC 2001b); a summary is provided below. Potential impacts to these groups are summarized in Section 5. Threatened and endangered species potentially present in the vicinity of the Osprey Platform, and potential effects of the waste discharges from the platform on threatened and endangered species, are described in Section 6.

## 4.1 PLANKTON

Planktonic communities typically consist of both phytoplankton and zooplankton. During summer months, lower Cook Inlet is among the most productive high-latitude shelf areas in the world (MMS 1996a). However, marine productivity in upper Cook Inlet is limited by severe turbidity and extreme tidal variations. The silt-laden waters that enter upper Cook Inlet load the inlet with sediment and retard its primary (phytoplankton) productivity (Kinney et al. 1970). Larrance et al. (1977) found that lower Cook Inlet marine productivity decreased in a northerly direction. At a station immediately south of the Forelands, the euphotic zone (the upper limit of effective light penetration for photosynthesis) was extremely shallow, ranging from 1 to 3 meters. The suspended material limits light penetration and probably causes reduced surface nitrate utilization in the spring (Sambrotto and Lorenzen 1987).

Zooplankton are used as food for fish, shellfish, marine birds, and some marine mammals. Zooplankton feed on phytoplankton, and their growth cycles respond to phytoplankton production. In the lower inlet, zooplankton populations vary seasonally with biomass reaching a low in the early spring and a peak in late spring and summer. Zooplankton is abundant in lower Cook Inlet, but occurs at much reduced levels in the upper inlet.

Impacts on the plankton communities that form the base of the marine food web may result in impacts on higher trophic organisms.

## 4.2 BENTHIC INVERTEBRATES

In addition to high turbidity, Cook Inlet is characterized by extreme tidal fluctuations of up to 12.2 meters (NOAA 1999) that produce strong currents in excess of 8 knots (Tarbox and Thorne 1996). The amount of protected benthic habitat is likely reduced by the periodic scouring or substrate movement caused by Cook Inlet currents that bottleneck at the Forelands, near the Osprey Platform.

Mollusks, polychaetes, and bryozoans dominate the infauna of seafloor habitats in Cook Inlet. Feder et al. (1981) found over 370 invertebrate taxa in samples from lower Cook Inlet. Substrates consisting of shell debris generally have the most diverse communities and are dominated by mollusks and bryozoans (Feder and Jewett 1987). Muddy-bottom substrates are occupied by mollusks and polychaetes, while sandy-bottom substrates are dominated by mollusks. Nearshore infauna, where sediments are fine and sedimentation rates are high, consists mostly of mobile deposit-feeding organisms that are widely distributed through the area. Infaunal organisms are important trophic links for crabs, flatfishes, and other organisms common in the waters of Cook Inlet.

Epifauna are dominated by crustaceans, mollusks, and echinoderms. The percentage of sessile organisms in Cook Inlet is relatively low inshore and increases towards the continental shelf (Hood and Zimmerman 1987). Rocky-bottom areas consist of lush kelp beds with low epifaunal diversity, moderate kelp beds with well-developed sedentary and predator/scavenger invertebrates, and little or no kelp with moderately developed predator/scavenger communities and a well-developed sedentary invertebrate community (Feder and Jewett 1987).

A 16-inch diameter, 3-foot long pipe dredge was used at the Osprey Platform to collect six benthic samples. Organisms were collected after the samples were washed through a 1-mm screen, and sent to Dr. Steve Jewett at the University of Fairbanks for identification. From the samples, one complete anemone (*Metridium* sp.) and fragments of unidentified bivalves, mollusks, barnacles, hydroids, and gastropods were identified – less than 20 grams (wet weight) from a total sediment volume of 0.075 cubic meters (NCG 2001).

## 4.3 Fish

Few studies of marine fish in upper Cook Inlet have been published. The fish of central and lower Cook Inlet have been better studied, due in part to the numerous commercial fisheries in the area. Because of low phytoplankton productivity and the severe tidal currents, it is thought that upper Cook Inlet does not provide a plentiful primary food source or much safe habitat for fish. However, recent studies of beluga utilization of Cook Inlet may warrant further investigation of Cook Inlet forage fish (NMFS 2000a).

### 4.3.1 Anadromous Fish

Anadromous fish migrate through upper Cook Inlet towards spawning habitat in rivers and streams, and juveniles travel through Cook Inlet toward marine feeding areas. The Susitna River drainage is a primary source of these anadromous fish in upper Cook Inlet.

#### *4.3.1.1 Salmon*

All five Pacific salmon species: pink salmon (*Oncorhynchus gorbuscha*); chum salmon (*O. keta*); sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and chinook or king salmon (*O. tshawytscha*) are found in Cook Inlet. Run timing and migration routes for all five salmon species overlap. In upper Cook Inlet, adult salmon inhabit marine and estuarine waters from early May to early November (ADFG 1986).

Pink salmon is typically the smallest salmon species in Cook Inlet, averaging between 3 and 5 pounds. Pink salmon enter their spawning streams between late June and October and typically spawn within a few miles of the shore, often within the intertidal zone. The eggs are buried in the gravel of stream bottoms and hatch in the winter. In spring the young emerge from the gravel and migrate downstream to salt water. Pink salmon stay close to the shore during their first summer, feeding on small organisms such as plankton, insects and young fish. At about one year of age, pink salmon move offshore to ocean feeding grounds where their food consists mainly of plankton, fish and squid. Return migration to fresh water takes place during the second summer with few exceptions. The even-year pink salmon return is typically stronger than the odd-year return in Cook Inlet (ADFG 1986).

Chum salmon grow to an average weight of between 7 and 18 pounds. Chum salmon remain nearshore during the summer where their diet consists of small insects and plankton. In the fall, they start moving offshore where they feed on plankton. They return to fresh water in the fall and spawn late in the year. Most chum salmon spawn in areas similar to those used by pink salmon, but sometimes travel great distances up large rivers (e.g. up to 2,000 miles up the Yukon River). Chum salmon usually return to streams to spawn after 3 to 5 years at sea.

Sockeye salmon spawn in stream systems with lakes; fry may reside up to three years in freshwater lakes before migrating to sea. Most sockeye spend two to three winters in the North Pacific Ocean before returning to natal streams to spawn and die. Sockeye salmon is the most important commercial salmon species in Cook Inlet (ADFG 1999).

Coho salmon return to spawn in natal stream gravels from July to November, usually the last of the five salmon species. Fry emerge in May or June and live in ponds, lakes and stream pools, feeding on drifting insects. Coho salmon may reside in-stream up to three winters before migrating to sea where they typically remain for two winters before returning to spawn (ADFG 1986).

Chinook salmon are the first of the five species to return each season. They reach the Susitna River in approximately mid-May (ADFG 1986). Soon after hatching, most juvenile chinook salmon migrate to sea, but some remain for a year in fresh water. Most chinook salmon return to natal streams to spawn in their fourth or fifth year. The Susitna River supports the largest chinook salmon run in upper Cook Inlet, which includes systems below the Forelands to the latitude of N 59° 46' 12", near Anchor Point (ADFG 1986).

#### *4.3.1.2 Other Anadromous Fish*

Bering cisco (*Coregonis laurettae*) have been reported in the Susitna River drainage (Barrett et al. 1985). Bering cisco enter river systems in the late summer. In 1982, spawning peaked mid-October in the Susitna River. Egg incubation occurs over winter and larvae move into northern Cook Inlet after ice-out in the spring from late April to May (Morrow 1980).

Dolly Varden (*Salvelinus malma*) that inhabit Cook Inlet can be anadromous or reside in fresh water. Non-resident Dolly Varden cycle seasonally between freshwater and marine environments. They often overwinter in freshwater drainages, then disperse into coastal waters during summer to feed on small fishes and marine invertebrates (Morrow 1980). In Cook Inlet, Dolly Varden spawn annually in rivers during the fall from late August to October (Scott and Crossman 1973; Morrow 1980). Like other salmonids, Dolly Varden lay eggs in hollowed-out redds (shallow cavities dug into streambeds where salmonids spawn) located in swift moving water; hatching occurs the following spring. Juvenile Dolly Varden remain in their natal streams for 2 to 3 years.

White sturgeon (*Acipenser transmontanus*) are anadromous fish found in upper Cook Inlet. They are believed to spend most of life near shore in water depths of 30 meters or less. Although little is known about white sturgeon migrations while in salt water, one tagged specimen was captured 1,056 km from where it was tagged (Morrow 1980). In the spring, most mature white sturgeon enter the estuaries and lower reaches of river systems. They spawn over rocky bottoms in swift water where the sticky eggs adhere to the river bottom. The amount of time needed for the eggs to hatch is not known. After spawning, the adults return to sea (Morrow 1980).

### 4.3.2 Pelagic Fish

Eulachon (*Thaleichthys pacificus*) are small anadromous forage fish (up to approximately 23 cm long; MMS 1995) found throughout Cook Inlet. Mature eulachon, typically three years old, spawn in May soon after ice-out in the lower reaches of streams and rivers. The Susitna River supports a run of eulachon estimated in the millions (ADFG 1983, Barrett et al. 1985). Females broadcast their eggs over sand or gravel substrates where the eggs anchor to sand grains. Eggs hatch in 30 to 40 days, depending on the water temperature. Eulachon larvae are then flushed out of the drainage and mature in salt water. As juveniles and adults, they feed primarily on copepods and plankton. As the spawning season approaches, eulachon gather in large schools at stream and river mouths. Most eulachon die after spawning (Hart 1973). Eulachon is most important as a food source for other fish, birds and marine mammals. The Cook Inlet population also supports small dipnet fisheries in upper Cook Inlet.

Pacific herring (*Clupea pallasi*) are a larger forage fish (up to 38 cm in Alaska; Hart 1973) that enter lower Cook Inlet to spawn in early April and possibly into the fall (MMS 1995). Female herring lay adhesive eggs over rock and seaweed substrates. Depending on water temperature, eggs hatch in three to seven weeks. Herring stay nearshore until cold winter water temperatures drive them offshore to deeper, warmer waters. Herring have been harvested for bait in Cook Inlet as far north as the Forelands (Blackburn et al. 1979). The Cook Inlet herring fishery now targets Kamishak Bay on the west side of lower Cook Inlet. A small herring sac roe fishery has been suspended since the 1998 season because of low herring abundance. Alaska Department of Fish and

Game biologists observed about 8,100 tons of herring in the Kamishak Bay District in 2000; biomass must exceed a threshold of 8,000 tons before a commercial sac roe harvest can be considered for Kamishak Bay.

Pacific sand lance (*Ammodytes hexapterus*) is a schooling fish that sometimes bury themselves in beach sand (Hart 1973). Pacific sand lance spawn within bays and estuaries, typically between December and March. Eggs are demersal, but will suspend in turbulent waters (Williams et al. 1964). Pacific sand lance larvae are found both offhsore and in intertidal zones (Fitch and Lavenberg 1975, Kobayashi 1961). Early juvenile stages are pelagic, while the adult burrowing behavior develops gradually (Hart 1973). Major food items of the juvenile sand lance include copepods, other small crustaceans, and eggs of many forms (Hart 1973; Fitch and Lavenberg 1975). This species is commonly preyed upon by lingcod, chinook salmon, halibut, fur seals, and other marine animals (Hart 1973), and appears to be an important forage species. Pacific sand lance have been caught off Chisik Island, southwest of West Foreland (Fechhelm et al. 1999).

### 4.3.3 Groundfish

The Pacific halibut (*Hippoglossus stenolepis*) is a large flatfish that occurs throughout Cook Inlet. Halibut concentrate on spawning grounds along the edge of the continental shelf at water depths of 182 to 455 meters from November to March. Significant spawning sites in the vicinity of lower Cook Inlet are Portlock Bank, northeast of Kodiak Island, and Chirikof Island, south of Kodiak Island (IPHC 1998). Temperature influences the rate of development, but typically eggs hatch in 20 days at 5º Celsius (ADFG 1986). As eggs develop into larvae, they float in the water column and drift passively with ocean currents. Halibut larvae's specific gravity decreases as they grow. Three to five month old larvae drift in the upper 100 meters of water where they are pushed by winds to shallow sections of the continental shelf. At six months old, juveniles settle to the bottom in nearshore waters where they remain for one to three years (Best and Hardman 1982). Juvenile halibut then move further offshore (IPHC 1998). Halibut migrate seasonally from deeper water in the winter to shallow water in summer. Accordingly, the fishery is most active in deep areas early in the season (i.e. May) whereas activity can be as shallow as 20 meters during mid-summer.

A recreational fishery in central Cook Inlet targets Pacific halibut. The Sport Fish Division of the Alaska Department of Fish and Game estimate that 75,709 halibut were caught by sport fishermen in central Cook Inlet between May 1 and July 31, 1995 (McKinley 1996).

Pacific cod (*Gadus macrocephalus*) are distributed over lower Cook Inlet. They are fast-growing bottom-dwellers that mature in approximately three years. They may reach lengths of up to one meter (Hart, 1973). Cod spawn during an extended period through the winter and eggs may hatch in one week, depending on water temperature. Cod are harvested offshore in the Gulf of Alaska by trawl, longline, pot, and jig gear. Cod move into deep water in autumn and return to shallow water in spring. Pacific cod populations sustain a rapid turnover due to predation and commercial fishing. The Gulf of Alaska stock is projected to decline as a result of poor year-classes produced from 1990 through 1994 (Witherell, 1999).

Starry flounder (*Platichthys stellatus*) have been caught in central Cook Inlet (Fechhelm et al. 1999) and are likely to occur in northern Cook Inlet. Starry flounder spawn from February through April in shallow water (Hart 1973). They generally do not migrate, although one starry flounder was caught 200 km from where it had been tagged (Hart 1973). Starry flounder tolerate low salinities and some have been caught within rivers.

Arrowtooth flounder (*Atheresthes stomias*) and yellowfin sole (*Pleuronectes asper*) may also extend into Cook Inlet. Little is known about the life history of these flatfish. Arrowtooth flounder larvae have been taken from depths of 200 meters to the surface in June off British Columbia (Hart 1973). Both have been caught off Chisik Island in central Cook Inlet (Fechhelm et al. 1999).

#### 4.3.4 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Act (MSA), PL-104-267, which regulate fishing in U.S. waters, included substantial new provisions to protect important habitat for all federally managed species of marine and anadromous fish. The amendment created a new requirement to describe and identify "essential fish habitat" (EFH) in each fishery management plan. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on all actions undertaken by the agency that may adversely affect EFH.

This mandate was intended to minimize adverse effects on habitat caused by fishing or non-fishing activities, and to identify other actions to encourage the conservation and enhancement of this habitat. Cook Inlet contains EFH for a total of 35 species including walleye pollock, Pacific cod, and salmon. Routine operations and accidents can affect EFH by damaging habitats used for breeding, spawning, feeding, or growth to maturity.

Fishery Management Plans are obliged to identify habitat areas of particular concern (HPC) within EFH. HPCs include living substrates in shallow water that provide food and rearing habitat for juvenile fish, and spawning grounds that may be impacted by shore-based activities. Estuarine and nearshore habitats of Pacific salmon (e.g. eel grass [*Zostera* sp.] beds) and herring spawning grounds (e.g. rockweed [*Fucus* sp.] and eel grass) are HPCs that can be found in Cook Inlet. Offshore HPCs include areas with substrates that serve as cover for organisms including groundfish. Areas of deepwater coral are also considered HPC, but populations are concentrated off southeast Alaska, out of the proposed project area. All anadromous streams qualify as HPC.

An EFH Assessment has been performed for the wastewater discharges from the Osprey Platform. This assessment is provided as Appendix C to the *Draft Environmental Assessment for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and Gas Development Project, Cook Inlet, Alaska* (SAIC 2001b).

### 4.4 Marine Mammals

Marine mammals that range throughout the Gulf of Alaska, including Cook Inlet, are described below. These species are protected under the Marine Mammal Protection Act (MMPA) and are managed by the U.S. Fish and Wildlife Service (USFWS) and NMFS. Threatened and endangered species of marine mammals are discussed in Section 6.

### 4.4.1 Minke Whale

Minke whales (*Balaenoptera acutorostrata*) occur in the North Pacific from the Bering and Chukchi Seas south to near the equator (Leatherwood et al. 1982). Minke whales are relatively common in the nearshore waters of the Gulf of Alaska (Mizroch 1992), but are not abundant in any other part of the eastern Pacific (Brueggeman et al. 1990). While Minke whales are unlikely to migrate into Cook Inlet, it could occur.

Minke whales breed in temperate or subtropical waters throughout the year (Dohl et al. 1981). Peaks of breeding activity occur in January and in June (Leatherwood et al. 1982). Calving occurs in winter and spring (Stewart and Leatherwood 1985). Females are capable of calving each year, but a two-year calving interval is more typical (Leatherwood et al. 1982).

Minke whales in the North Pacific prey mostly on euphausiids and copepods, but also feed on schooling fishes including Pacific sand lance, northern anchovy, and squid (Leatherwood et al. 1982, Stewart and Leatherwood 1985, Horwood 1990).

No estimates of the number of minke whales in the north Pacific or Alaskan waters have been made, nor are there data on trends in the minke whale population in Alaskan waters (Hill and DeMaster 2000). The annual human-caused mortality is considered insignificant. Minke whales in Alaska are not listed as depleted under the MMPA, or considered a strategic stock (Hill and DeMaster 2000).

### 4.4.2 Gray Whale

Gray whales (*Eschrichtius robustus*) historically inhabited both the North Atlantic and North Pacific oceans. A relic population survives in the western Pacific. The eastern Pacific or California gray whale population has recovered significantly, and now numbers about 23,000 (Hill et al. 1997). The eastern Pacific stock was removed from the Endangered Species List in 1994 and is not considered a strategic stock by the NMFS.

The eastern Pacific gray whale breeds and calves in the protected waters along the west coast of Baja California and the east coast of the Gulf of California from January to April (Swartz and Jones 1981; Jones and Swartz 1984). At the end of the breeding and calving season, most of these gray whales migrate about 8,000 km (5,000 mi.) north, generally along the west coast of North America, to the main summer feeding grounds in the northern Bering and Chukchi seas (Tomilin 1967; Rice and Wolman 1971; Braham 1984; Nerini 1984).

Gray whale occurrences in Cook Inlet are most likely uncommon. As they move through the Gulf of Alaska on their northward and southward migrations, gray whales closely follow the coastline (Calkins 1986). They generally tend to by-pass Cook Inlet as they pass through the Barren Islands and the waters south of Kodiak Island (Calkins 1986). However, a cow and a calf were observed in lower Cook Inlet as recently as the summer of 2000 (M. Eagleton, NMFS, pers. comm.).

### 4.4.3 Killer Whale

Killer whales (*Orcinus orca*) occur along the entire Alaska coast (Dahlheim et al. 1997) from the Chukchi Sea, into the Bering Sea, along the Aleutian Islands, Gulf of Alaska, and into Southeast

Alaska (Braham and Dahlheim 1982). Seasonal concentrations occur in Shelikof Strait and the waters around Kodiak Island (Calkins 1986). Killer whales are known to inhabit Cook Inlet waters during the summer and have been observed pursuing beluga whales in Cook Inlet (M. Eagleton, NMFS, pers. comm.). Killer whales utilizing Cook Inlet are most likely from the Eastern North Pacific Northern Resident stock of killer whales, which is estimated at 717 individuals (Hill and DeMaster 1999). Currently, there are no reliable data describing the population trend for this stock (Hill and DeMaster 1999).

### 4.4.4 Harbor Porpoise

The harbor porpoise (*Phocoena phocoena*) is distributed in waters along the continental shelf, and is most frequently found in cool waters with high prey concentrations (Watts and Gaskin 1985). The range of the harbor porpoise within the eastern North Pacific Ocean is primarily restricted to coastal waters and extends from Point Barrow, along the coast of Alaska, and the west coast of North America to Point Conception, California (Gaskin 1984). Harbor porpoise densities are much greater in their southern range (Washington, northern Oregon and California) than in Alaskan waters (Dahlheim et al. submitted). Harbor porpoise are not migratory. Little information on the population dynamics of harbor porpoises is known. However, harbor porpoise occur in Cook Inlet (Calkins 1983). The most recent population estimate for harbor porpoise in Alaskan waters is 30,000 (Hill and DeMaster 1999).

The major predators on harbor porpoises are great white sharks and killer whales. Unlike other delphinids, harbor porpoises forage independently (Würsig 1986) feeding on small, schooling fishes, such as northern anchovy and Pacific herring, as well as squid.

### 4.4.5 Dall's Porpoise

Dall's porpoises (*Phocoenoides dalli*) are widely distributed along the continental shelf (Hall 1979) as far north as 65° N (Buckland et al. 1993) and are abundant throughout the Gulf of Alaska (Calkins 1986). Dall's porpoises prefer water depths greater than 20 m deep (Hall 1979) and are commonly found in lower Cook Inlet (Calkins 1983). The only apparent gaps in their distribution in the Gulf of Alaska are in upper Cook Inlet and Icy Bay (Consiglieri and Braham 1982). The current estimate for the Alaska stock of Dall's porpoise is 83,400 (Hill and DeMaster 1999).

### 4.4.6 Harbor Seal

Harbor seals (*Phoca vitulina richardsi*) range from Baja California, north along the western coast of the United States, British Columbia, and Southeast Alaska, west through the Gulf of Alaska and the Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. Hill and DeMaster (2000) estimated 29,000 individuals in the Gulf of Alaska stock. The Gulf of Alaska populations around Kodiak and Tugidak Islands have grown since the early 1990s (Small 1996; Withrow and Loughlin 1997) but overall the stock numbers are in decline (Hill and DeMaster 2000).

Harbor seals inhabit estuarine and coastal waters, hauling out on rocks, reefs, beaches, and glacial ice flows. They are generally non-migratory, but move locally with the tides, weather, season, food availability, and reproduction activities (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969; Bigg

1981). Female harbor seals give birth to a single pup while hauled out on shore or on glacial ice flows. The mother and pup remain together until weaning occurs at 3 to 6 weeks (Bishop 1967; Bigg 1969). Little is known about breeding behavior in harbor seals. When molting, seals spend the majority of the time hauled out on shore, glacial ice, or other substrates. Harbor seals consume a variety of prey in estuarine and marine waters. Prey type varies regionally and seasonally in the Gulf of Alaska. Walleye pollock are the dominant prey in the eastern Gulf, and octopus is the dominant prey in the western Gulf.

No harbor seal haulout areas have been documented in the vicinity of the West Foreland. The closest harbor seal haulout area observed during a 1996 NMFS aerial survey is located just north of Big River, about 15 miles south of the West Foreland (Rehberg 2001).

### 4.4.7 Sea Otter

Sea otters (*Enhydra lutris*) occur in the coastal waters of the North Pacific Ocean and the southern Bering Sea. Typically, sea otters inhabit nearshore waters less than 35 m deep with sandy or rocky bottoms that support abundant populations of benthic invertebrates (Rotterman and Simon-Jackson 1988). In some areas, sea otters occur far from shore (e.g. further than 8 km in Prince William Sound); large aggregations are found more than 30 km north of Unimak Island (Rotterman pers. obs. from Rotterman and Simon-Jackson 1988). Canopy-forming kelp beds are used for resting and foraging although sea otters may also use areas void of kelp beds (Rotterman and Simon-Jackson 1988). Typical haulout habitat includes rocky points, sandy beaches, spits, islets, sandbars, rocks, and ice flows (Rotterman and Simon-Jackson 1988).

More than 90 percent of the world sea otter population is located in coastal Alaskan waters (Rotterman and Simon-Jackson, 1988). The south central Alaska stock of sea otters was estimated in 1998 to have a minimum population size of 20,948 (Gorbics et al. 1998). Sea otters consume an array of sessile and slow-moving benthic invertebrates including sea urchins, clams, mussels and crabs, octopus, squid, and epibenthic fishes (Rotterman and Simon-Jackson 1988).

In Cook Inlet, sea otters are primarily found in lower Cook Inlet (Calkins 1983). Population numbers are unknown, but it is thought that the Cook Inlet population is expanding. They have been observed in Tuxedni Bay on the west side and north of Anchor Point on the east side (Calkins 1983).

## 4.5 Marine Birds

This section describes seabirds, shorebirds, and waterbirds. Threatened and endangered species of marine and coastal birds are discussed in Section 6.

### 4.5.1 Seabirds

Lower Cook Inlet is one of the most productive areas for seabirds in Alaska. Approximately 27 species, comprised of an estimated 100,000 seabirds (USFWS 1992), occur in Cook Inlet, and about 18 species breed in the Inlet. Seabird breeding colonies occur along the coastline of the Gulf of Alaska and the lower Cook Inlet (DeGange and Sanger 1987, USFWS 1992). Approximately 71 colony sites have been recorded throughout Cook Inlet (USFWS 1992). The largest seabird colonies occur on Chisik and Duck Islands in lower Cook Inlet (USFWS 1992). Species breeding in lower Cook Inlet include glaucous-winged gulls, black-legged kittiwake, common murre, pigeon guillemot, horned and tufted puffins, parakeet auklet, and red-faced, double-crested, and pelagic cormorants.

Large concentrations of seabirds occur in Cook Inlet and the Gulf of Alaska during the spring when returning breeding species and migrants from breeding grounds in the southern hemisphere move into the area. The numbers remain high throughout the summer and decline in the fall as they begin to migrate to their wintering grounds (DeGange and Sanger 1987). Seabird numbers in Cook Inlet are lowest during the winter.

### 4.5.2 Shorebirds

Approximately 30 shorebird species occur as breeding birds and migrants in Cook Inlet. Although shorebirds nest in Cook Inlet, the most important areas for shorebird use in the region of the proposed project are the migratory stop-over areas in the northern Gulf of Alaska/lower Cook Inlet where birds stop to rest and feed. An important location for shorebirds during migration is western Cook Inlet (DeGange and Sanger 1987). These include the intertidal zones of Drift River, Iniskin Bay, and Chinitna Bay. Kachemak Bay in Lower Cook Inlet is also an important feeding and resting area for shorebirds during migration.

During spring migration, millions of shorebirds congregate at coastal intertidal mudflats to feed before continuing their northward migration. Most birds pass through the area between late April and mid May with the peak of the migration in early May. The two most common species are dunlin and western sandpiper. Turnover is high and individual birds probably only stop to feed and rest for a few days before continuing.

### 4.5.3 Waterbirds

Waterbirds (including loons) and waterfowl (swans, geese and ducks) occur as breeding birds and migrants in the Cook Inlet region. Nineteen species of waterbirds are common or abundant in the Cook Inlet/Shelikof Strait area, either as residents or migrants (MMS 1996a). Species include pintail, oldsquaw, common eider, common goldeneye, common merganser, red-breasted merganser, harlequin duck, greater scaup, mallard, gadwall, American widgeon, green-winged teal, arctic loon, common loon, red-throated loon, horned grebe, Canada goose, Pacific black brant, and emperor goose.

Waterbird density peaks in the region during the spring (April-May), when large numbers of waterbirds migrate through the area. The Cook Inlet area supports large populations (>200,000) of staging waterfowl on tidal flats (Susitna Flats, Portage Flats, Palmer Hay Flats, and Chickaloon Flats in the upper inlet and Bachatna Flats in the lower inlet), along river mouths, and in bays, particularly on the west side of the inlet (Redoubt, Trading, Tuxedni, and Kamishak bays). Areas of particularly high concentration are Tuxedni Bay, Kachemak Bay (especially sea and diving ducks), Kamishak Bay (sea ducks), Redoubt Bay (geese and ducks), and Iniskin-Iliamna Bay (diving ducks; Arneson 1980, MMS 1996a). The highest diversity and abundance of waterbirds are found in exposed inshore waters and various habitats associated with bays and lagoons, including open water, tidal mudflats, deltas, floodplains, and salt marshes (MMS 1984). Loons, grebes, and sea ducks are typically found on bays and exposed inshore waters; geese and dabbling ducks are primarily found on river floodplains and marshes; diving ducks mostly use bay waters (MMS 1984).

Waterbird density declines in summer as many birds leave the area. However, relatively high concentrations of sea ducks remain in Iniskin/Iliamna Bay and outer Kachemak Bay (MMS 1996a). During July and August, a molt migration of all three scoter species concentrates tens of thousands of birds in the coastal areas from Kotzebue Sound to Cook Inlet (MMS 1996b). Important staging areas used prior to fall migration are Kachemak Bay, Douglas River mudflats, Kenai River mudflats, Tuxedni Bay, Drift River, Chinitna Bay, Iliamna Bay, Ursus Cove, and other parts of lower Cook Inlet (Erikson 1976). On the west side of Shelikof Strait, Katmai Bay is important for several species of sea ducks, including white-winged scoter, greater scaup, Barrow's goldeneye, and harlequin ducks (Cahalane 1944).

In the fall, sea ducks depart the area, partially accounting for the overall decline in bird density relative to spring and summer densities (MMS 1996a). However, densities of dabbling duck and geese increase during this time, as migrants move into the area. In fact, 47 percent of all birds remaining in the coastal region are sea ducks (MMS 1996a). Four areas of Cook Inlet retain high bird densities: inner Kachemak Bay, southwestern Kamishak Bay, Tuxedni Bay, and northwestern Kachemak Bay; dabbling ducks, sea ducks, and gulls comprise 85 percent of all birds observed (MMS 1996a). Habitat use is similar to spring and summer patterns, with habitats associated with bays and lagoons being most heavily used (Arneson 1980).

Common winter residents along the southern Alaskan coast include oldsquaw, common and king eiders, harlequin ducks, and scoters. Over one million scoters winter in the Bering Sea, and several hundred thousand winter from the eastern Aleutians east to Kodiak Island, Cook Inlet, and Prince William Sound (Arneson 1980, Forsell and Gould 1981; Agler et al. 1995).

About 30 to 35 species of waterfowl regularly occur in the Cook Inlet area, including two species of swans (trumpeter and tundra swans), six species of geese, about 25 duck species, and six species of loons/grebes. The distribution of waterfowl within the region varies between the upper and lower inlet on a seasonal basis, and waterfowl are distributed differently between the eastern and western sides of Cook Inlet. Wintering populations of waterfowl are confined primarily to the lower inlet because of limited open water north of the Forelands.

Several waterfowl species occurring in the Cook Inlet area are of particular concern due to their limited breeding distribution, small population size, or use of critical habitats: trumpeter swan, Tule white-fronted goose, and snow goose.

Trumpeter swans arrive in Cook Inlet in early April and move to their breeding areas by late April (ADFG 1985). Nesting and brood rearing continue through late August and early September, and migration commences in late September and early October. Nesting swans are found on both sides of the central and upper inlet with major concentrations on the western side in Trading Bay, along the Kustatan River, and in Redoubt Bay. The 1990 census for trumpeter swans counted 1,661 swans in the Cook Inlet area, which is approximately 12 percent of the estimated total population in the state.

The Tule white-fronted goose breeds on the western side of Cook Inlet in Redoubt Bay (NCG 2001). They arrive in Cook Inlet in early April, begin nesting in May, and most have departed the area by late August. The nesting population in Cook Inlet is estimated at about 1,500 (total population estimated at 5,000) and the presence of nesting areas in the Redoubt Bay area was a primary reason for the creation of the Redoubt Bay State Critical Habitat Area.

Snow geese stage in large numbers on the Kenai River flats in mid-April (Rosenberg 1986). Total numbers of snow geese using the area vary annually, based on spring weather conditions, but counts have ranged between 2,000 and 15,000 birds each spring (Campbell and Rothe 1985, 1986; Rosenberg 1986). In addition to the Kenai River flats, snow geese stage in spring on the Kasilof River flats, the Susitna Flats, and Redoubt Bay (Campbell and Rothe 1986). An estimated 30,000 to 35,000 snow geese move through Cook Inlet in spring (Campbell and Rothe 1986) before they leave for their breeding grounds by early May.

# 5.0 POTENTIAL IMPACTS OF DISCHARGES ON MARINE ORGANISMS

This section summarizes the potential effects of waste discharges from the Osprey Platform on marine organisms that may be present in the vicinity, and on humans. Because all drilling-related wastes will be reinjected rather than discharged to surface waters, this section focuses on non-drilling waste discharges such as sanitary waste, deck drainage, and domestic waste.

## 5.1 TOXICITY OF DISCHARGES

Permitted waste streams from the Osprey Platform contain minimal chemical or biological toxicity, except as described below. Impacts of the sanitary waste discharge include the possible reduction in ambient dissolved oxygen concentrations in the receiving waters when sanitary waste is discharged (Tetra Tech 1994). The dissolved oxygen standard for aquatic life is usually 6 mg/L (Jones and Stokes 1989), while the ambient dissolved oxygen in the receiving waters of Cook Inlet is assumed to be higher than 8 mg/L (USEPA 1984). In an analysis of a worst case scenario, EPA (1984) concluded that the discharge of treated sewage effluent during offshore exploratory drilling should not significantly impact aquatic life when ambient dissolved oxygen concentrations are at least 1 mg/L above the dissolved oxygen standard for aquatic life of 6 mg/L. Because the sanitation device is an aerated system capable of providing a minimum of 2,100 cubic feet of air per pound of BOD, dissolved oxygen in the effluent is expected to meet this requirement when the system is properly operated in accordance with the operating manual (UIG 1998).

The wastewater will be chlorinated to remove fecal coliform (FC) bacteria. Effluent from the clarifier will flow through a chlorinator and into a 65-gallon chlorine detention tank where chlorine will dissipate for 30 minutes to an hour. Operated in accordance with the operating manual, the chlorine will reduce the fecal coliform bacteria to levels at or below the Alaska Water Quality Standard of 14 FC/100 ml.

The NPDES General Permit for Oil and Gas Production Platforms in Cook Inlet (USEPA 1999) requires a total residual chlorine concentration of at least 1 mg/L to ensure proper disinfection of the sanitary waste without causing harm to the aquatic life. In the case of the Osprey Platform sanitary waste, it appears that sodium sulfite will be used to dechlorinate the effluent in-line immediately prior to discharge (UIG 1998). The sodium sulfite reacts with free and residual chlorine instantaneously, consuming a small amount of alkalinity (1.38 mg of $CaCO3$/ml chlorine consumed) (UIG 1998). The concentration of total residual chlorine in the final effluent is expected to be less than or equal to 2 ug/L (Amundsen 2000b). Thus the water quality standards for residual chlorine will be met at the end-of-pipe, causing no direct or indirect impacts on aquatic life.

Oil is the primary pollutant found in deck drainage, with concentrations estimated at 24 to 450 mg/L (USEPA 1996). Other potential contaminants include detergents and spilled drilling fluids. Contaminated deck drainage will be treated through an oil-water separator prior to discharge and will be required to meet state water quality standards. Therefore, no adverse impacts on water quality are predicted to result from discharge of deck drainage.

Domestic waste, which may contain kitchen solids and trace amounts of detergents, cleansers, and oil and gas, does not represent a significant discharge flow. Potential effects of domestic waste discharges are difficult to determine given the absence of analytical data, but are expected to be minimal.

Non-contact cooling water is not significantly different in composition than ambient seawater, except for an elevated temperature (estimated at 62° to 84°F; USEPA 1996). Forest Oil's permit application indicates that non-contact cooling water will be discharged at an average temperature of less than 60°F, with a maximum daily value of 70°F; therefore, no environmental impacts are predicted.

Boiler blowdown and fire control system test water are intermittent discharges that will be treated through an oil-water separator to remove oil and grease. No adverse impacts on water quality are predicted due to these discharges.

Excess cement slurry represents another intermittent discharge. The pH may be as high as 12, with temperatures up to 80°F and oil and grease up to 50 ppm (Amundsen 2000a). According to Forest Oil, excess cement slurry will not be treated prior to discharge. The draft NPDES permit for the Osprey Platform requires all discharges to have a pH between 6.5 and 8.5; this waste stream, if untreated, could exceed the draft effluent limits. Although the exact composition of the cement is not documented, given the small waste volume and intermittent nature of the discharge, it is not likely to represent a significant pollution source and is not predicted to result in adverse impacts.

In addition to meeting water quality standards or anticipated NPDES effluent limits, the wastes from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. Brandsma (1999) determined that the high suspended solids discharge of drilling muds would be reduced more than two orders of magnitude within 100 meters under the least turbulent conditions, and three orders of magnitude under more turbulent conditions. It is expected that pollutants in the sanitary and other wastes will be dissipated to undetectable concentrations within a few feet of the discharge.

### 5.2 Human Health Impacts

Ingestion of organisms that have accumulated significant concentrations of heavy metals or other contaminants from drilling muds and produced water is the potential principal source of adverse human health effects caused by offshore oil and gas drilling operations. Because all drilling muds and cuttings will be reinjected rather than discharged, and because the permitted discharges from the Osprey Platform are only minimally toxic, no human health impacts are predicted.

### 5.3 Physical Effects of Discharge

The sanitary effluent is anticipated to contain average concentrations of TSS of less than 50 mg/L (Amundsen 2000b). This concentration is less than the daily maximum concentrations permitted for sanitary discharges from the oil and gas production platforms in Cook Inlet that operate under the NPDES General Permit (USEPA1999) and the maximum daily limit in the proposed NPDES permit for the Osprey Platform.

Excess cement slurry may contain up to 200,000 mg/L of total suspended solids (daily maximum). However, because this waste stream is intermittent and the volume is small (about 4,200 gallons per event), it is not predicted to cause adverse impacts to marine organisms.

In addition, as described above, the wastes from the Osprey Platform will be discharged to a section of Cook Inlet which has been demonstrated to be a non-depositional, high-energy environment. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants.

Therefore, no physical effects of the discharge from the Osprey Platform are predicted.

## 5.4 SUMMARY

Potential impacts of discharges from the Osprey Platform are summarized below.

### 5.4.1 Lower Trophic Level Organisms

Low concentrations of BOD and nutrients in the sanitary waste discharge could stimulate primary productivity and enhance zooplankton production. This effect is predicted to be negligible.

### 5.4.2 Fish

No adverse impacts on fish are expected due to the waste stream discharges from the Osprey Platform. Total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. Discharges will be diluted by the strong tidal flux of Cook Inlet. All of the wastewater discharges will comply with water quality standards for the state of Alaska (18 AAC 70). Therefore, impacts on fish from normal operations are not predicted to occur. Potential impacts on fish and essential fish habitat are discussed in more detail in the Essential Fish Habitat Assessment prepared for the Osprey Platform (SAIC 2001b, Appendix C).

### 5.4.3 Marine Birds

No adverse impacts on marine birds are expected due to the waste stream discharges from the Osprey Platform. Minor noise impacts generated during production operations could result in negligible to minor impacts on nesting birds in the Redoubt Bay Critical Habitat Area.

### 5.4.4 Marine Mammals

Discharges will be diluted by the strong tidal flux of Cook Inlet. Low concentrations of nutrients in the sanitary waste discharge may stimulate primary productivity and enhance zooplankton production, but these effects will probably be negligible. Total residual chlorine (the only toxic contaminant of concern) will be discharged at concentrations that meet water quality criteria designed to protect both human health and aquatic life. All of the wastewater discharges will comply with water quality standards for the state of Alaska (18 AAC 70). Therefore, impacts on marine mammals from wastewater discharges are not predicted to occur.

### 5.4.5 Human Health

Because all drilling muds and cuttings will be reinjected rather than discharged, and because the permitted discharges from the Osprey Platform are only minimally toxic, no human health impacts are predicted.

# 6.0 THREATENED AND ENDANGERED SPECIES

## 6.1 INTRODUCTION

Section 7 of the ESA requires federal agencies to conserve endangered and threatened species. It also requires all federal agencies to consult with NMFS or USFWS if they determine that any action they fund, authorize, or carry out may affect a listed species or designated critical habitat. The federal action under discussion in this document is the discharge of waste streams associated with oil and gas production operations at the Osprey Platform in Cook Inlet.

The following threatened and endangered species may be present near the proposed project:

- Steller's eider (*Polysticta stelleri*) – threatened
- Short-tailed albatross (*Phoebastria albatrus*) – endangered
- Fin whale (*Balenoptera physalus*) – endangered
- Humpback whale (*Megaptera novaeangliae*) – endangered
- Blue whale (*Balenoptera musculus*) – endangered
- Northern right whale (*Eubalaena glacialis*) – endangered
- Steller sea lion, western stock (*Eumetopias jubatus*) – endangered

In addition, the Beluga whale (*Delphinapterus leucas*) is listed as depleted under the Marine Mammal Protection Act and is also discussed in this section as a cetacean of special concern.

A biological assessment (BA) was prepared to assess the impacts of wastewater discharges from the Osprey Platform on threatened and endangered species of marine mammals or birds that may be present near the project area (SAIC 2000a); the BA provides additional details about the distribution, life history, diet, predators, population status, critical habitat, and factors affecting survival for each of the identified species.

## 6.2 ABUNDANCE AND DISTRIBUTION OF THREATENED AND ENDANGERED SPECIES

### 6.2.1 Birds

#### *6.2.1.1 Steller's Eider*

The USFWS listed the Alaskan breeding population of Steller's eiders (*Polysticta stelleri*) as threatened under the ESA on June 11, 1997. The Alaskan population of Steller's eiders nests along the western Arctic Coastal Plain in Alaska from approximately Point Lay east to Prudhoe Bay, with a known concentration in some years near Pt. Barrow, and in low numbers along the Yukon-Kuskokwim Delta (65 FR 49). Historically, nesting ranged from St. Lawrence Island and the Hooper Bay area north to Barrow (AOU 1997), and was rare east of Point Barrow. The current population trend for the Alaskan breeding population of Steller's eiders is unknown. USFWS estimates that hundreds or thousands of Steller's eiders may occur on the North Slope during the breeding season in early to mid-June.

In late June through August, Steller's eiders migrate southward along the northwest coast of Alaska (Gabrielson and Lincoln 1959) to the Alaska Peninsula, where they undergo a flightless molt for 10 to 14 days (65 FR 49). The geographic range of their wintering grounds remains unknown. However, Steller's eiders are thought to over-winter in relatively ice-free marine waters from Kodiak Island west to Unimak Island, Alaska (Palmer 1976). The timing of spring migration to the nesting grounds is dependent on weather conditions. Kessel (1989) noted that eiders typically move through the Bering Strait between mid-May and early June. Steller's eiders gather in staging areas before beginning their spring migration. These staging areas can contain thousands to tens of thousands of birds and are primarily located along the northern side of the Alaska Peninsula, including Port Heiden, Port Moller, Nelson Lagoon, and Izembek Lagoon (65 FR 49). Staging areas for the spring migration may also be used as winter habitat.

Steller's eiders feed on crustaceans, amphipods and mollusks (Cottom 1939, Peterson 1981). Eiders primarily feed near shore during the winter (65 FR 49). Raptors, gulls, jaegers, ravens, and foxes are their main predators, and where present, gulls are thought to harass eiders in winter feeding grounds, as well as in nesting areas (65 FR 49).

Little is known about the population dynamics of Steller's eiders. The reduction of eiders on historical breeding grounds suggests that Steller's eiders are either abandoning these historic nesting areas or that the population is declining. Currently, the causes of population declines in Steller's eiders are unknown, although possible causes include habitat loss or modification, increased predation in areas where human activities have artificially expanded predator populations by providing shelter and alternative food sources, lead poisoning on the Yukon-Kuskokwim Delta caused by the ingestion of lead shot while feeding, and food availability caused by changes in the Bering Sea ecosystem (USFWS 2000). In Siberia, possible causes of Steller's eider decline could also include habitat loss on the breeding grounds due to oil and gas exploration and unreported subsistence hunting (USFWS 2000).

In January 2001, the USFWS designated 7,330 square kilometers as critical habitat for Steller's eiders into five units (USFWS 2001). These units are located along the coastal areas of the Yukon-Kuskokwim Delta and along the Alaska Peninsula. Although Steller's eiders use areas in lower Cook Inlet, none were designated as critical in the final rule.

Steller's eiders may occur in Cook Inlet as occasional visitors during the winter months. Little information exists on the abundance and distribution of Steller's eiders in lower Cook Inlet. Steller's eiders have wintered in Kachemak Bay and further north along the eastern side of Cook Inlet (Balogh 1999). This area is considered wintering habitat for Steller's eiders. Balogh (1999) also indicated that no Steller's eiders have been observed on the western side of Cook Inlet, but that only a limited number of eider surveys have been conducted on the western side of Cook Inlet. The most recent observations of Steller's eiders in Cook Inlet reported approximately 1,000 Steller's eiders south of Ninilchik in 1999 (T. Antrobus, USFWS, pers. comm.). In 1997, 650 individuals were seen in the same area near Ninilchik. USFWS plans to conduct Steller's eiders surveys in the future to ascertain abundance and distribution of Steller's eiders in Cook Inlet.

#### *6.2.1.2 Short-tailed Albatross*

The short-tailed albatross (*Phoebastria albatrus*) is a pelagic seabird with long, relatively narrow wings adapted for soaring low over the water. The short-tailed albatross is the largest of the three species of Northern Pacific albatross, with an average wingspan of 84 inches and an average body length of 37 inches (Farrand 1983). It has a relatively long life span and may reach 40 years of age (Sherburne 1993). Breeding age is approximately 6 years, at which time they begin nesting every year. The short-tailed albatross is a monogamous, colonial nester and returns to nesting areas. The diet of short-tailed albatross includes squid, small fish, and crustaceans (DeGrange 1981).

Historically, the short-tailed albatross bred only in the western North Pacific (Sherburne 1993) on islands in Japan and Taiwan (63 FR 211). Today, there are only two known active breeding colonies, one on Torishima Island and one on Minami-Kojima Island, Japan. Short-tailed albatross usually arrive at breeding colonies in October and lay eggs by the end of the month. Females lay a single egg, and both parents incubate the eggs for 64-65 days. By late May, the chicks are almost full-grown, and the adults depart, leaving the chicks to fledge (63 FR 211). Avian and terrestrial predators of short-tailed albatross chicks include crows (*Corvus* sp.) and possibly introduced black rats and domestic cats on Torishima Island. Sharks may prey on albatross in the open ocean as well (63 FR 211).

The current world population of the short-tailed albatross is estimated to be 500 to 1,000 individuals. Currently, the short-tailed albatross is listed as endangered throughout its range under the 1973 Endangered Species Act (50 CFR 17). Alaska also lists the short-tailed albatross as endangered under the State of Alaska list of endangered species.

The short-tailed albatross was historically found year-round in the North Pacific from Siberia to the western coast of North America and the Bering Sea to the Hawaiian Islands (Roberson 1980). Documented critical habitat for the albatross occurs outside U.S. jurisdiction. However, important foraging habitat of the short-tailed albatross under U.S. jurisdiction includes the coastal regions of the North Pacific Ocean and Bering Sea during the non-breeding season and throughout the northwestern Hawaiian Islands during the breeding season. Annual observations of short-tailed albatross have been recorded in the Gulf of Alaska and the North Pacific since 1947. Although Cook Inlet is described as potential habitat for short-tailed albatross, none have been observed in the coastal waters of Cook Inlet since observations began (1947 through 1999; AKNHP 2000, IPHC 1999).

### 6.2.2 Marine Mammals

Endangered whales, such as the fin, humpback, blue, and northern right whale, could be present in lower Cook Inlet. Any observations of these species would most likely be near the entrance to Cook Inlet (Smith 1999). Most documentation of larger whales in Cook Inlet comes from historical records, mainly strandings (M. Eagleton, NMFS, pers. comm.). Historical data suggest that small numbers of humpback and fin whales have been observed in portions of lower Cook Inlet on occasion during the summer months and have been documented within one mile of shore (MMS 1996c). Humpback and fin whales are not found regularly above Kachemak Bay (Smith and Mahoney 1999). During the summer of 2000, humpbacks were observed around the entrance of Cook Inlet, near the Barren Islands. Blue and northern right whales are only accidental visitors in lower Cook Inlet.

### *6.2.2.1 Fin Whale*

Fin whales (*Balenoptera physalus*) range from subtropical to arctic waters. The North Pacific fin whale population was estimated at 16,600 individuals in 1991 (NMFS 1991). Current abundance estimates are not available (Hill and DeMaster 2000). There have been no reports of incidental mortality of fin whales related to commercial fishing operations in the North Pacific during this decade. There also has been no reported harvest of fin whales by subsistence hunters in Alaska and Russia (Hill and DeMaster 2000). There are no published reports that indicate recovery of this stock has or is taking place (Braham 1992, Hill and DeMaster 2000).

The summer distribution of fin whales extends from central California to the Chukchi Sea. In Alaskan waters, some whales spend the summer feeding in the Gulf of Alaska, while others migrate farther north. Fin whales feed throughout the Bering and Chukchi Seas from June through October. Fin whales usually occur in high-relief areas where productivity is probably high (Brueggeman et al. 1988). Fin whales winter in the waters off the coast of California. Migration southward occurs from September through November. Northward migration begins in spring with migrating whales entering the Gulf of Alaska from early April to June (MMS 1996b). Most sightings of fin whales in southcentral Alaskan waters have been documented in the Shelikof Strait, near Kodiak Island and lower Prince William Sound (Montgomery Watson 1993). Authenticated sightings of fin whales are rare in Cook Inlet as most documentation has been based on carcass sightings (M. Eagleton, NMFS, pers. comm.). No critical habitat in Alaska has been designated for this species.

Fin whales usually breed and calve in the warmer waters of their winter range. Breeding can occur in any season, but the peak occurs between November and February (Tomilin 1967, Ohsumi 1958). Fin whales are opportunistic feeders, taking euphausiids, copepods, fish and squid (Lowry et al. 1982).

### *6.2.2.2 Humpback Whale*

Humpback whales (*Megaptera novaeangliae*) in the North Pacific are seasonal migrants that feed in the cool, coastal waters of the western United States, western Canada, and the Russian far east (NMFS 1991). The Western North Pacific stock of humpback whales spends winter and spring in waters off Japan and migrates to the Bering Sea, Chukchi Sea, and Aleutian Islands in the summer and fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991). The current estimate of the Western North Pacific humpback whale stock (the stock most likely utilizing the Cook Inlet area) is 394 animals (Calambokidis et al. 1997). Sightings of humpbacks are rare in Cook Inlet, although they are common around the Barren Islands, south of Cook Inlet in the summer months. No critical habitat in Alaska has been designated for this species.

Breeding and calving occur on the wintering grounds near Japan. Most births occur between January and March (Johnson and Wolman 1984). Humpbacks feed on euphausiids, amphipods, mysids, and small fish, such as Pacific herring, capelin, anchovies, sardines, cod, and sand lance (Wolman 1978, Wing and Krieger 1983). Humpback whales are thought to feed mainly during the summer months (Wolman 1978).

Reliable information on the trends in abundance for the Western North Pacific humpback whale is not available. No commercial fishery related mortalities have been observed during 1990 to 1997 monitoring. The annual estimated mortality rate due to commercial fisheries is 0.2 whales per year. However, this is considered a minimum rate since no data are available from Japanese, Russian, or international waters (Hill and DeMaster 2000).

#### *6.2.2.3 Blue Whale*

Summering blue whales (*Balenoptera musculus*) from the North Pacific stock are present in waters from California to Alaska. Blue whales occur in a narrow area just south of the Aleutian Islands from 160° W to 175° W (Berzin and Rovnin 1966, Rice 1974). The species is also distributed in an area north of 50° N latitude extending from southeastern Kodiak Island across the Gulf of Alaska and from southeast Alaska to Vancouver Island (Berzin and Rovnin 1966). Whaling records indicate that large concentrations of this species once occurred in the northern part of the Gulf of Alaska southwest of Prince William Sound in the Port Banks area (Nishiwaki 1966). However, recent sightings in Alaskan waters have been scarce (MMS 1996b). No critical habitat in Alaska has been designated for this species.

Blue whales usually begin migrating south out of the Gulf of Alaska by September (Berzin and Rovnin 1966). Migration routes are thought to be along the western coast of North America. The North Pacific blue whale population winters from the open waters of the mid-temperate Pacific south to at least 20° N (MMS 1996b). The northward spring migration begins in April or May, with whales traveling in the eastern Pacific (Berzin and Rovnin 1966). Mating and calving are thought to take place over a five-month period during the winter (Mizroch et al. 1984). Blue whales feed principally on krill, small euphausiid crustaceans, primarily in their summer range (Nemoto 1959, Berzin and Rovnin 1966).

There is relatively little information about the abundance or mortality of blue whales since hunting ceased in 1967 (MMS 1996b). The most recent estimate of the North Pacific blue whale population was approximately 1,700 individuals (Barlow and Gerrodette 1996). There is no evidence that the blue whale population is recovering (MMS 1996b, Mizroch et al. 1984).

#### *6.2.2.4 Northern Right Whale*

Northern right whales (*Eubalaena glacialis*) can grow up to 50 feet in length. These large, slow swimming whales tend to congregate in coastal waters. Little is known about the life history of the right whale. No calving grounds have been found in the eastern North Pacific (Scarff 1986). Consequently, right whales are thought to calve in southern coastal waters of their distribution during the winter months (Scarff 1986). Scarff (1986) hypothesized that right whales summering in the eastern North Pacific mate, calve, and overwinter in the mid-Pacific or Western North Pacific. The migration patterns of the North Pacific stock are also unknown. During summer, it is assumed that right whales migrate to their summer feeding grounds in the higher latitudes of their range. In winter, they migrate to the more temperate waters (Braham and Rice 1984). The location and type of critical habitat for right whales is unknown due to the rarity of this species. Right whales feed primarily on zooplankton, copepods and euphausiids (MMS 1996b).

Whaling records indicate that right whales in the North Pacific range across the entire North Pacific north of 35º N. Commercial whalers hunted right whales nearly to extinction during the 1800s. From 1958 to 1982, there were only 32 to 36 sightings of right whales in the central North Pacific and Bering Seas (Braham 1986). In the eastern North Pacific south of 50º N, only 29 reliable sightings were recorded between 1900 and 1994 (Scarff 1986, Scarff 1991, Carretta et al. 1994). Wada (1973) estimated a total population of 100 to 200 in the North Pacific. In 1996, a right whale was sighted off Maui (Hill and DeMaster 2000) and a group of 3 to 4 right whales was sighted in Bristol Bay. In 1997, a group of 5 to 9 individuals was seen in approximately the same Bristol Bay location (Hill and DeMaster 2000). A reliable current estimate of abundance for the North Pacific right whale stock is not available (Hill and DeMaster 2000). Although they may travel through the Gulf of Alaska, it is highly unlikely that right whales use Cook Inlet.

#### *6.2.2.5 Steller Sea Lion, Western Stock*

Steller sea lions (*Eumetopias jubatus*) range along the North Pacific Rim from northern Japan to California (Loughlin et al. 1984). The centers of abundance and distribution are located in the Gulf of Alaska and the Aleutian Islands. At sea, Steller sea lions commonly occur near the 200-m depth contour, but are seen from near shore to well beyond the continental shelf (Kajimura and Loughlin 1988).

In 1997, NMFS designated the Western stock of Steller sea lions as endangered under the ESA (62 FR 30772). Aerial and ground-based surveys suggest a minimum population size of approximately 39,000 Steller sea lions in the western U.S. in 1998 (Sease and Loughlin 1999). The first reported trend counts of Steller sea lions in Alaska indicated at least 140,000 sea lions in the Gulf of Alaska and Aleutian Islands (Kenyon and Rice 1961, Mathisen and Lopp 1963). Counts in 1976 and 1979 estimated 110,000 sea lions and suggested a major population decrease in the Aleutian Islands beginning in the mid 1970s (Braham et al. 1980). The largest declines occurred in the eastern Aleutian Islands and western Gulf of Alaska, but declines have also occurred in the central Gulf of Alaska and the central Aleutian Islands. Counts at trend sites from 1990 to 1996 indicate a 27 percent decline. Counts at trend sites in 1998 suggest a further 7.8 percent decline since 1996 (Hill and DeMaster 2000).

Adult female Steller sea lions usually breed annually (Pitcher and Calkins 1981). Females reach sexual maturity between three and six years of age and can produce young into their early 20s (Mathisen et al. 1962, Pitcher and Calkins 1981). Females produce a single pup each year. Pups are born from late May to early July. Young are usually weaned by the end of their first year but may continue to nurse until age three (Lowry et al. 1982). Males reach sexual maturity between three and seven years of age.

Steller sea lions eat a variety of fish and invertebrates. Harbor seals, spotted seals, bearded seals, ringed seals, fur seals, California sea lions and sea otters are also occasionally eaten (Tikhimirov 1959, Gentry and Johnson 1981, Pitcher 1981, Pitcher and Fay 1982, Byrnes and Hood 1994). Walleye pollock is the principal prey in most areas of the Gulf of Alaska and the Bering Sea (NMFS 1995). In the Aleutian Islands, Atka mackerel was the most common prey followed by walleye pollock and Pacific salmon (NMFS 1995).

Steller sea lions use specific locations along the coast of Alaska as rookeries and haul-out sites. All sea lion haul-out sites are considered critical habitat because of their limited numbers and high-density use. Alteration of these areas through disturbance or habitat destruction could have a significant impact on the use of these sites by sea lions. Although no rookeries or haul-out sites have been identified in the Cook Inlet area, Steller sea lions may range and forage throughout Cook Inlet during salmon runs (Smith 1999). For example, one male Steller sea lion was observed at the mouth of the Susitna River (M. Eagleton, NMFS, pers. comm.). However, only a small number of animals are present at any particular time and they would not be present in any significant concentrations in Cook Inlet. The nearest reported Steller sea lion rookery is the Sugarloaf Islands rookery located in the Barren Islands (58° 53.0" N, 152° 2.0" W) (NMFS 2000c). The nearest major Steller sea lion haul-out is located on Ushagat Island (58° 55.0" N, 152° 22.0" W), also in the Barren Islands.

Declines in juvenile survival appear to be an important proximate cause of the decline in the Alaskan population of Steller sea lions from the early 1980s to the present. Since 1985, researchers have noted a reduced abundance of juvenile animals on declining rookeries (Merrick et al. 1987; NMFS and ADFG unpublished data cited in NMFS 1995). York (1994) suggested a 10 percent to 20 percent decrease in juvenile (ages 0 to 4) survival in the Kodiak Island population, and Pascual and Adkinson (1994) concluded that juvenile survival could have declined as much as 30 percent to 60 percent. Despite the apparent declines in juvenile survival, the large-scale declines which occurred in the Aleutian Islands during the 1970s and from 1985 to 1989 are too large to be caused solely by changes in juvenile survival. NMFS (1995) suggests that acute declines in adult survival were overlaid on an ongoing, chronic decline in juvenile survival.

Steller sea lion pup mortality occurs from drowning, starvation caused by separation from the mother, crushing by larger animals, disease, predation, and biting by females other than the mother (Orr and Poulter 1967; Edie 1977). Juvenile and adult Steller sea lions are eaten by sharks and killer whales, but the rates and significance of this predation is not known.

A number of factors do not appear to be important in the decline of Steller sea lion populations, including the effects of toxic materials, parasites, entanglement, commercial and subsistence harvest, disturbance, and predation (NMFS 1992). Factors that remain under consideration are shooting, incidental take in fisheries, disease, and changes in the quantity or quality of the prey base.

#### *6.2.2.6 Cetacean of Special Concern -- Beluga Whale*

Beluga whales (*Delphinapterus leucas*) are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich 1980). The Cook Inlet stock of beluga whales was listed as depleted under the MMPA on May 31, 2000 (65 FR 105; 50 CFR 216.15). After the completion of the status review, NMFS denied a petition to list the Cook Inlet stock of belugas as endangered (65 FR 121).

Klinkhart (1966) first surveyed Cook Inlet beluga whales in 1963 and 1964, at which time the minimum population was estimated to be between 300 and 400 whales. In 1979, 1982, and 1983, Calkins performed extensive aerial surveys of the inlet and reported sighting as many as 479 belugas in 1979 (Morris 1992) and estimated the stock at 1,300 animals. However, these surveys were not designed to estimate abundance throughout the entire Cook Inlet. Most past surveys have concentrated only on the upper inlet when belugas are congregated at the mouths of rivers for calving and feeding (Morris 1992). However, information on breeding and reproduction specific to the Cook Inlet belugas is generally lacking.

NMFS initiated population surveys in 1993 to estimate the abundance of Cook Inlet belugas. Surveys between 1994 and 1999 produced abundance estimates of 653, 491, 594, 440, 347, and 357 whales, respectively (65 FR 105). These numbers indicated more than a 40 percent decline in population size over the last 6 years. Beluga distribution data also suggest a reduction in offshore sightings in both upper and lower Cook Inlet during the summer (Rugh et al. 2000).

During the 2000 Cook Inlet beluga whale surveys, 184 individuals were sighted (Rugh et al. 2000). This was the lowest median raw count (the number of whales actually observed and not corrected for missed whales) of belugas since NMFS initiated the surveys in 1993. However, correcting for whales missed results in a population estimate of 435 (O'Harra 2001).

Beluga whales occupy different parts of Cook Inlet throughout the year (Sheldon 1993). Concentrations occur nearshore in the northwestern upper inlet from April through June (Calkins 1989). The largest counts of belugas have occurred during May and June (Morris 1992), particularly between the West Foreland and Knik Arm (Sheldon 1993). Withrow et al. (1994) report large aggregations of up to 260 near the mouths of the rivers. By August, beluga concentrations disperse along the coastline of the upper and central inlet. Groups of less than 10 animals distributed along the coastline north of Kalgin Island have been reported in late September (Withrow et al. 1994). With the return of ice in late fall, the population likely moves into the lower inlet (Sheldon 1993), although it appears that some belugas remain in the upper Cook Inlet during the winter if conditions are appropriate (NMFS 2000a). The tracking of two satellite-tagged belugas from September 2000 to January 2001 indicates that these whales were spending a portion of the winter in upper Cook Inlet (NMFS 2000a).

Current data on mortality and serious injury from all fishery related activities are not available for the Cook Inlet stock of beluga whales. In Cook Inlet, belugas may contact purse seines, drift gillnets, and set gillnets. However, it is currently thought that commercial fisheries in Cook Inlet have little, if any, interaction with belugas. Between 1981 and 1983 in Cook Inlet, an estimated 3 to 6 belugas were killed per year from interactions with fishing gear in Cook Inlet (Burns and Seaman 1986). Self-reports of beluga mortalities from commercial fisherman throughout the 1990s were considered incomplete and unreliable. Since 1999, observers have been used to document beluga mortalities from the Cook Inlet gillnet fisheries. No beluga mortalities or interactions with fisheries have been observed during the present observer program (Hill and DeMaster 2000).

The decline of Cook Inlet belugas has been primarily attributed to subsistence harvest by Alaska Natives (NMFS 2000b). Mean annual subsistence take of beluga whales from the Cook Inlet stock averaged 87 whales between 1993 and 1997. Currently, there is a moratorium on harvesting Cook Inlet belugas. Future harvest levels have yet to be determined. Because of the extremely low population numbers, cumulative harvest over a number of years would likely affect the recovery rate of the Cook Inlet population. During 1998, local Alaska Native organizations and NMFS began to formalize a specific agreement for management of the Cook Inlet beluga stock, and it was finalized in 2000.

Beluga whales feed seasonally on a variety of fishes, shrimps, squid, and octopus (Burns et al., 1985). Fish species that Cook Inlet belugas feed on during the summer include salmon, herring, eulachon, capelin, smelt, and arctic cod (Calkins 1989). Pacific tomcod may be an important food source for Cook Inlet belugas in autumn and winter when salmon and eulachon are not available (Calkins 1989).

Large groups of belugas congregate at river mouths in the upper drainages of Cook Inlet to feed on migrating prey species, such as the eulachon and salmon (Morris 1992). Belugas generally feed in the upper 30 feet of the water column (Morris 1992), with most feeding dives thought to be between depths of 20 and 100 feet and to last 2 to 5 minutes (ADFG 1999).

The killer whale is the beluga whale's only natural predator. Killer whales are common visitors to Cook Inlet and have been known to pursue belugas in Cook Inlet (M. Eagleton, NMFS, pers. comm.).

## 6.3 Effects of Permitted Discharges on Threatened and Endangered Species

This section summarizes potential impacts on threatened and endangered species from Osprey Platform discharges, including sanitary waste, deck drainage, domestic waste, non-contact cooling water, excess cement slurry, fire control system test water, and boiler blowdown. The discharges are described in Section 2.2. Potential impacts of wastewater discharges on threatened and endangered species were evaluated as part of a Biological Assessment (BA) prepared for the Osprey Platform (SAIC 2000a) in compliance with Section 7 of the ESA. Conclusions of the BA are summarized below.

### 6.3.1 Steller's Eider

Steller's eiders are only occasional winter visitors to the western side of Cook Inlet. Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller's eiders, nor is the action likely to adversely affect or jeopardize the threatened Alaska nesting populations or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller's eiders or their proposed critical habitat.

### 6.3.2 Short-tailed Albatross

The Short-tailed albatross has not been observed in the coastal waters of Cook Inlet since prior to 1947. Therefore, wastewater discharges associated with the Osprey Platform will not likely have any direct, indirect, or cumulative impacts on the Short-tailed albatross. Neither will it jeopardize the recovery of this species.

### 6.3.3 Fin, Humpback, Blue, and Northern Right Whales

Humpback and fin whales are not found regularly above Kachemak Bay; blue and northern right whales would be only accidental visitors to lower Cook Inlet. Discharges from the Osprey Platform are not likely to directly or indirectly impact any of the four endangered whale species, nor is the action likely to adversely affect or jeopardize the endangered Alaska populations or their critical habitat. The proposed project also will not have incremental effects resulting in a cumulative effects to these species.

### 6.3.4 Steller Sea Lion

A small number of Steller sea lions may occur near the project area. Discharges from the Osprey Platform will be diluted by the strong tidal flux of Cook Inlet, however, and any disturbance of Stellar sea lions would be very short-term and unlikely to adversely affect the animals. Wastewater discharges associated with the Osprey Platform are not likely to directly or indirectly affect Steller sea lions, nor is the action likely to adversely affect or jeopardize the threatened Alaska population or its critical habitat. The actions are also not likely to have incremental effects resulting in a cumulative impact to Steller sea lions or their proposed critical habitat.

### 6.3.5 Cetacean of Special Concern – Beluga Whale

Wastewater discharges from the Osprey Platform will occur outside areas in Cook Inlet where large concentrations of belugas are present during the summer (NMFS 2000a). Although the platform will be operated year-round, the West Foreland is not heavily used by beluga whales (Smith and Mahoney 1999). The volume and concentration of pollutants in the discharges from the platform are minimal; once released, the discharges will be rapidly dispersed by the strong tidal fluxes in Cook Inlet. Therefore, it is unlikely that wastewater discharges would directly or indirectly affect Cook Inlet belugas or their critical habitat. The proposed actions are also not likely to have incremental effects resulting in a cumulative impact to this species.

## 6.4 Summary

Wastewater discharges from the Osprey Platform are minimal, and their contribution to the cumulative loading of contaminants in Cook Inlet are predicted to be negligible. Based on the Cook Inlet tidal flux, the anticipated volume of wastewater discharge, and the Osprey Platform's contribution to the cumulative loading of waste discharges in Cook Inlet, the BA concluded that wastewater discharges from the Osprey Platform will be rapidly diluted and will likely have no adverse effect on the marine mammal and bird species described above or to critical habitat associated with these species.

# 7.0 COMMERCIAL, RECREATIONAL, AND SUBSISTENCE HARVEST

This section describes the commercial, recreational, and subsistence fisheries in Cook Inlet, and the potential impact of discharges from production drilling operations at the Osprey Platform.

## 7.1 COMMERCIAL HARVESTS

Commercial fishing has long been a major economic sector for the Cook Inlet area. The Alaska Department of Fish and Game (ADF&G) is responsible for management of the commercial fisheries in Alaska. ADF&G divide the inlet into the Central and Northern District for purposes of fisheries management. The proposed project straddles the boundary between the Northern and Central District, which is a line that extends from West Foreland to Boulder Point.

Commercial fishing operations in the Northern District are limited to set net fishing from shore. Set net fishing sites are located along most of the upper inlet from the West Foreland to Pt. Mackenzie on the west side of the inlet and from the East Foreland to Point Possession on the east side of the inlet. Openings for set netting are typically on specific days, intermittently occurring between early June and early September.

There are two known areas of set net fishing activities near the tip of the West Foreland. One site is located at Kustatan and the other is located at the southeasternmost tip of the West Foreland. The Kustatan site is registered with the Alaska Department of Natural Resources, while the other is not.

All five Pacific salmon species are caught in the Northern District set net fishery. Pink salmon during the even-year runs are the most abundant numerically, although they have very little value to the commercial fishery. Sockeye salmon are the second most frequently caught salmon and they account for over 50 percent of the ex-vessel value of the fishery.

In general, salmon catches by the commercial fisheries have remained relatively stable (SAIC 2000b). Price of the fish have dropped dramatically over the past 10 years and the industry in the Northern District, which had a value of about $3 million to $4 million in the late 1980s, is now valued at a little over $1 million annually.

## 7.2 RECREATIONAL FISHERY

The drainages of the upper inlet support some of the most intense sport fisheries in Alaska because of their proximity to Anchorage. This area consistently supports over 20 percent of the total annual sport fishing effort expended in Alaska (Mills 1992). Sport fishing in the northern and central inlet has been increasing steadily, with almost 500,000 angler days expended on northern inlet streams (Mills 1992, NCG 2001). The Kustatan River located immediately southwest of the West Foreland supports a relatively active sports fishery for chinook, sockeye, pink and coho salmon and for Dolly Varden (ADFG 1994); access to the river is primarily by small fixed wing aircraft. The majority of sport fishing occurs during the summer and fall months.

A recreational fishery in central Cook Inlet targets Pacific halibut. The Sport Fish Division of the Alaska Department of Fish and Game estimates that 75,709 halibut were caught by sport fishermen in central Cook Inlet between May 1 and July 31, 1995 (McKinley 1996).

## 7.3 SUBSISTENCE HARVESTS

Subsistence is defined by the Alaska National Interest Lands Conservation Act (ANILCA). Section 803 defines subsistence as:

> "…the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-eatable by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

This section discusses practices by households that may be altered or affected by waste discharges from the Osprey Platform. However, the use areas and practices differ as greatly as the size and socioeconomic character of each area's populations. Local subsistence values are critical in that households feel their subsistence activities are important, necessary, and satisfying with their overall cultural context. While many animals and plants may be taken for subsistence, it is the most common practices that are recorded and reported, especially for the west side of the inlet.

Subsistence tends to occur in areas of close proximity to settlements. These practices also tend to occur at locations where there is easy access and where the biomass concentration is high. The increasing population on the east side of the inlet has created limitations to subsistence practices, while on the west side of the inlet, many traditional practices continue with a greater diversity of species. Some subsistence practices are frequently conducted in conjunction with recreation (and should not be confused with recreational activities) on both sides of the inlet.

Tyonek is a critical subsistence focus area due to its proximity to the project. The following discussions also center on marine-related activities. Although terrestrial subsistence activities do occur, they are distant from and highly unlikely to be impacted by the proposed development.

### 7.3.1 Anadromous Fish

Many fish are harvested through subsistence and related activities, although salmon are the most important. The ADF&G has a number of established subsistence and educational fisheries in Cook Inlet. Within the upper inlet, these include the Tyonek subsistence salmon fishery, the Native Village of Eklutna educational fishery, and the Knik Tribal Council educational fishery. These are discussed in the following paragraphs. There are several other subsistence and educational fisheries in the inlet below the Forelands; however, they are not addressed because it is unlikely that fish potentially involved in these fisheries would encounter the project area.

The subsistence fishery in the Tyonek area was created by court order in 1980. It was originally open only to those individuals living in the Village of Tyonek but has subsequently been changed to allow any Alaskan to participate. Fishing is allowed only in the Tyonek Subdistrict of the

Northern District. Only one permit is allowed per household and each permit holder is allowed a single ten-fathom gillnet having a mesh size no greater than 6 inches. Fishing is allowed on specific days between May 15 and June 15, or until 4,200 Chinook salmon are taken. The permit allows 25 salmon per permit holder and 10 salmon for each additional household member. Chinook salmon harvests have ranged form 797 in 1990 to 2,750 in 1983.

In 1993, the ADF&G issued permits to Alaska residents accompanied by an Eklutna Native village member or a Knik Tribal Council Member to participate in this fishery. The permit allows each village to operate a single 10-fathom set gillnet having a mesh size no greater than 6 inches. The net may be set in Knik Arm adjacent to the village or in those waters within one mile from mean high water in an area from Goose Bay Creek north to Fish Creek. Total catch was 200 and 275 salmon for the Eklutna and Knik fisheries, respectively, in 1996 (NCG 2001).

### 7.3.2 Other Fish

Eulachon (hooligan) are taken in set nets and by dip netting along the west side of the upper inlet from Tyonek south to Shirleyville for both subsistence and personal use. About a quarter of all Tyonek households seek hooligan (Fall et al. 1984). Other species of fish are taken in small numbers. Rainbow trout are occasionally taken. Dolly Varden char are incidental to the taking of salmon in nets but are also taken in fresh water. About 15 percent of Tyonek households seek freshwater species (Fall et al. 1984).

### 7.3.3 Shellfish

Approximately 18 percent of the Tyonek households collect shellfish as subsistence activities. Cockles and razor clams are both taken in the lower inlet from between Drift River and Tuxedni Bay. These areas are well out of the project area.

### 7.3.4 Marine Mammals

Two types of marine mammals are taken. Beluga whales are actively sought and harbor seals are usually taken incidentally. Only 11 percent of Tyonek households attempt to take marine mammals and the actual contribution to the Tyonek diet is low (Fall et al. 1984).

Beluga whales are taken for subsistence, especially by urban Alaska Natives from the greater Anchorage area. The focus of the harvest is at the mouth of the Susitna River (Fall 1993). Some have also been shot just outside the mouth of the Kenai River, as local firearms ordinances limit the discharge of guns within the city limits.

Prior subsistence harvests of belugas have resulted in a substantial decline in their population to the extent that they are currently listed as a depleted species under the Marine Mammal Protection Act. Under the depleted status, future subsistence take is proposed to be limited to two belugas annually (NMFS 2000a).

Harbor seals are normally taken only incidentally. They may be harvested while in pursuit of other subsistence interests or in transit to subsistence areas. Most frequently, harbor seals are taken around set net sites during salmon season.

### 7.3.5 Birds

Waterfowl, including many species of ducks and geese, are taken around the Trading Bay area. As many as 47 percent of the Tyonek households seek waterfowl in the nearshore marshes (Fall et al. 1984, Fall 1993).

## 7.4 EFFECTS OF WASTE STREAM DISCHARGES ON HARVEST QUANTITY AND QUALITY

The production drilling operations at the Osprey Platform are predicted to have insignificant impacts on the quantity or quality of the commercial, recreational, or subsistence harvests in Cook Inlet, based on the relatively limited volume of wastes discharged, the limited areal extent of pollutant discharges, the rapid dilution of discharges by the strong tidal flux of Cook Inlet, and the mobility of harvested species.

# 8.0 COASTAL ZONE MANAGEMENT AND SPECIAL AQUATIC SITES

## 8.1 COASTAL ZONE MANAGEMENT

### 8.1.1 Requirements of the Coastal Zone Management Act

The Coastal Zone Management Act requires that states make consistency determinations for any federally-licensed or permitted activity affecting the coastal zone of a state with an approved Coastal Zone Management Program (CZMP) (16 USC Sec. 1456(c)(A) Subpart D). Under the Act, applicants for federal licenses and permits must submit a certification that the proposed activity complies with the state's approved CZMP. The state then has the responsibility to either concur with or object to the consistency determination.

Consistency certifications are required to include the following information (15 CFR 930.58):

- A detailed description of the proposed activity and its associated facilities
- A brief assessment relating the probable coastal zone effects of the proposal and its associated facilities to relevant elements of the CZMP
- A brief set of findings indicating that the proposed activity, its associated facilities, and their effects are consistent with relevant provisions of the CZMP
- Any other information required by the state.

### 8.1.2 Relevance of Requirements

Consistency determinations are required if a federally-licensed or permitted activity "affects" the coastal zone. Waste stream discharges during production oil and gas drilling activities at the Osprey Platform in Cook Inlet will occur in state waters. Therefore, a consistency assessment is required.

### 8.1.3 Status of Coastal Zone Management Planning

The Alaskan Coastal Management Program (ACMP) was approved by the U.S. Department of Commerce in 1979. The state coastal management policies and guidelines included in the ACMP are intended to be refined by local districts preparing district Coastal Management Plans (CMPs). Completed district CMPs must be approved by the Alaska Coastal Policy Council. District CMPs must then be approved by the Department of Commerce, either as routine program implementation or as an amendment to the ACMP. Once approved by the Department of Commerce, district CMPs become the basis for federal consistency determinations.

The proposed project falls under the provisions of the Kenai Peninsula Borough (KPB) CMP. The KPB CMP (KPB 1990) includes issues, goals, objectives, and policies directly related to energy and industrial development. These policies are implemented through local review of state and federal permit applications and through borough land use planning and zoning regulations.

### 8.1.4 Relevant Policies

Policies of the ACMP that are potentially relevant to waste discharges from offshore oil and gas exploration are set forth in the ACMP standards (6 AAC Chapter 80). Article 2 sets forth standards related to a number of uses and activities in the Alaska coastal zone. It sets forth the following policy for subsistence uses: "Districts and state agencies shall recognize and assure opportunities for subsistence usage of coastal areas and resources." This policy is designed to be fully implemented in district CMPs.

Article 3 sets forth standards for resources and habitats that are relevant to waste discharges from oil and gas exploration. Of the habitat types it identifies, the following habitats could be affected by these discharges: offshore areas, estuaries, wetlands and tideflats, and exposed high energy coasts. The fundamental standard for management of these habitats is that they "must be managed so as to maintain or enhance the biological, physical, and chemical characteristics of the habitat which contribute to its capacity to support living resources" (6 AAC 80.130[b]).

The Kenai Peninsula Borough CMP was federally approved by the Department of Commerce in June 1990 and includes state coastal waters in upper Cook Inlet. The Kenai Peninsula Borough CMP incorporates the state policies and adds the following enforceable policies:

- To the extent feasible and prudent, all temporary and permanent developments, structures, and facilities in marine and estuarine waters shall be sited, constructed, and operated in a manner that does not create a hazard or obstruction to commercial fishing operations (KPB CMP Enforceable Policy 2.3).
- Within marine and estuarine waters of the coastal area, operators of activities relating to oil, gas, and mining exploration and production, shall provide timely written notification to a list of fishing organizations maintained by the Kenai Peninsula Borough to apprise commercial fishing interests of the schedule and location of development activities prior to initiation of the project. This notice shall include a schedule of activities and a map or description of any potential conflicts or physical obstructions which may impact or preclude commercial fishing opportunities or damage/contaminate fishing gear including but not limited to subsea pipelines, subsea wellhead structures, and modifications to the natural shoreline topography or sea-bottom profile (e.g., causeways, artificial islands, dredge spoil disposal sites) (KPB CMP Enforceable Policy 2.3).
- Projects that require dredging or filling in streams, rivers, lakes, wetlands, or saltwater areas including tideflats, will be located, designed, constructed, and maintained in a manner so as to: a. avoid significant impacts to important fish and wildlife habitat; b. avoid significant interference with fish migration, spawning, and rearing as well as other important life history phases of wildlife; c. limit areas of direct disturbance to as small an area as possible; d. minimize the amount of waterborne sediment traveling away from the dredge or fill site; and e. maintain circulation and drainage patterns in the area of the fill (KPB CMP Enforceable Policy 2.4).
- All land and water use activities shall be planned and conducted to mitigate potential adverse impacts on fish and wildlife populations, habitats, and harvest activities. Mitigation shall include the following sequential steps: a. Avoid the loss of natural fish and wildlife populations, habitat, and harvest activities; b. When the loss cannot be avoided, minimize loss by incorporating measures to reduce the amount or degree of loss; c. When the loss cannot be avoided or minimized, restore or rehabilitate the resource that was lost or disturbed to its pre-disturbance condition, to the extent feasible and prudent; or d. When loss or damage is substantial and irreversible and the above objectives cannot be achieved, compensation for the resource and/or harvest loss shall be considered. In the case of loss of habitat production potential, enhancement of other habitats shall be considered as an alternative means of compensation. In general, compensation with similar habitats in the same locality is preferable to compensation with other types of habitat or habitats located elsewhere (KPB CMP Enforceable Policy 2.6).
- Development and resource extraction activities shall be sited and conducted to minimize accelerated shoreline erosion or adverse impacts to shoreline processes. Developers shall retain existing vegetative cover in

erosion-prone areas to the greatest extent feasible and prudent. In cases where development or other activities lead to removal of vegetation, erosion shall be prevented or, if it occurs, shall be remedied through revegetation or by other appropriate measures (KPB CMP Enforceable Policy 3.3).

- Commercial/Industrial operations shall use necessary measures to prevent drilling wastes, oil spills, and other toxic or hazardous materials from contaminating surface and groundwater (KPB CMP Enforceable Policy 5.2).
- Any industrial water withdrawal shall comply with the requirements of AS 46.15 and may require that aquifer testing of the production well(s) and monitoring of nearby public or private wells be conducted. Results of testing shall be submitted to the Kenai Peninsula Borough and the Alaska Department of Natural Resources; these results should demonstrate what effects the withdrawal of water necessary to serve the fully developed project will have on prior water rights holders within the area of influence (KPB CMP Enforceable Policy 5.2).
- To the extent feasible and prudent, existing industrial facilities or areas and pipeline route shall be used to meet new requirements for exploration and production support bases, transmission/shipment (including pipelines and transportation systems), and distribution of energy resources (KPB CMP Enforceable Policy 5.3).
- Projects which require dredging, clearing or construction in productive habitats shall be designed to keep these activities to the minimum area necessary for the project (KPB CMP Enforceable Policy 5.4).
- Activities associated with oil and gas resource exploration, industrial development, or production shall minimize navigational interference and be located or timed to avoid potential damage to fishing gear. Offshore pipelines and other underwater structures will be located, designed or protected so as to allow fishing gear to pass over without snagging or otherwise damaging the structure or gear (KPB CMP Enforceable Policy 5.5).

- Pipelines and pipeline right-of-ways shall, to the extent feasible and prudent, be sited, designed, constructed, and maintained to avoid important fishing grounds and to minimize risk to fish and wildlife habitats from a spill, pipeline break, or other construction activities. Pipeline crossings of fishbearing waters and wetlands important to waterfowl and shorebirds shall incorporate mitigative measures, to the extent feasible and prudent, to minimize the amount of oil which may enter such waters as a result of a pipeline rupture or leak (KPB CMP Enforceable Policy 5.6).
- Geophysical surveys will, to the extent feasible and prudent, be located, designed, and constructed in a manner so as to avoid disturbances to fish and wildlife populations, habitats, and harvests. Seasonal restrictions, restrictions on the use of explosives, or restrictions relating to the type of transportation utilized in such operations will be included as necessary to mitigate potential adverse impacts (KPB CMP Enforceable Policy 5.9).
- Geophysical surveys in fresh and marine waters supporting fish or wildlife will require the use of energy sources such as airguns, gas exploders, or other sources that have been demonstrated to be harmless to fish and wildlife and human uses of fish and wildlife. Blasting for purposes other than geophysical surveys will be approved on a case-by-case basis after all steps have been taken to minimize impacts and when no feasible and prudent alternatives exist to meet the public need (KPB CMP Enforceable Policy 5.9).
- To the extent feasible and prudent, underwater pipelines shall be buried. If pipelines are not buried they shall be designed to allow for the passage of fishing gear, or the pipeline route shall be selected to avoid important fishing areas, and anadromous fish migration and feeding areas (KPB CMP Enforceable Policy 6.4).
- Projects in areas traditionally used for subsistence shall be located, designed, constructed, and operated to minimize adverse impacts to subsistence resources and activities (KPB CMP Enforceable Policy 11.2).
- All bank cuts, fills and exposed earthwork adjacent to a wetland or water body must be stabilized to prevent erosion and sedimentation which may occur during or after construction. Bank stabilization measures shall be designed and constructed to protect habitat values by including irregular bank contours and insuring that nearshore water velocities do not increase (KPB CMP Enforceable Policy 12.4).
- Seabird colony sites and haul-outs and rookeries used by sea lions and harbor seals (as identified in ADF&G Regional Guides or with the best available information at the time of project review) shall not be physically altered or disturbed by structures or activities in a manner that would preclude or interfere with continued ties in a manner that would preclude or interfere with continued use of these sites. To the extent feasible and prudent, development structures and facilities with a high level of noise, acoustical or visual disturbance shall

maintain a one-half mile buffer from identified use areas for sea lions, harbor seals, and marine birds during periods when these species are present (KPB CMP Enforceable Policy 12.7).

- Uses and activities within or adjacent to coastal waters shall not interfere with migration or feeding of whales. Interference refers to conduct or activities that disrupt an animal's normal behavior or cause a significant change in the activity of the affected animal (KPB CMP Enforceable Policy 12.8).
- If previously undiscovered artifacts or areas of historic, prehistoric, or archaeological importance are encountered during development activities, the site shall be protected from further disturbance and the State Historic Preservation Office shall immediately be notified to evaluate the site or artifacts (KPB CMP Enforceable Policy 14.2).

### 8.1.5 Consistency of Waste Discharges with Relevant Coastal Management Programs and Policies

The project is currently undergoing a coastal zone management consistency review by the Alaska Division of Governmental Coordination to ensure that there are no conflicts with coastal zone management objectives.

Based on the analysis presented in this ODCE, waste discharges associated with oil and gas production activities at the Osprey Platform in Cook Inlet appear to comply with relevant ACMP policies. This assessment is based on the following findings:

- Based on the analyses in Section 7 of the ODCE, opportunities for subsistence use of coastal resources are unlikely to be threatened by discharges from the Osprey Platform
- Coastal habitats will be managed to maintain the biological, physical, and chemical characteristics of the habitats which contribute to their capacity to support living resources. This finding is based on analyses in Sections 5 and 6 of the ODCE indicating that coastal habitats are unlikely to experience significant adverse impacts from discharges of drilling mud and cuttings.
- Offshore areas will be managed to maintain sport, commercial, and subsistence fisheries. This finding is based on analyses in Section 7 indicating that recreational, commercial, and subsistence harvests are unlikely to experience degradation from waste discharges.
- Estuaries, wetlands, and tideflats will not be adversely affected by toxic waste discharges. This finding is based on analyses in Section 3 indicating that any toxic substances in the discharges will be rapidly diluted and are not likely to be detectable in the vicinity of coastal habitats.
- Mixing and transport processes of high energy coasts will not be affected by discharges of drilling mud and cuttings.

## 8.2 SPECIAL AQUATIC SITES

Effects of discharges from the Osprey Platform on biologically important communities are evaluated in Sections 5 and 6.

The KPB CMP has identified two potential Areas Meriting Special Attention (AMSA) in the general area. The Chuitna Potential AMSA was nominated to recognize, encourage, and plan for major resource and related development while protecting the traditional lifestyle and natural environment of this area. The Nikiski Industrial Area was nominated as a potential AMSA due to increasing potential for land use conflicts between existing industrial uses and other uses. The CMP recommends that the KPB initiate a comprehensive development program for future development in the AMSA. The proposed project is not located within either of these AMSAs.

The State of Alaska manages several special areas within the immediate vicinity of the proposed project. These include the Trading Bay State Game Refuge to the north of the project area and the Redoubt Bay Critical Habitat Area, which are both managed by the Alaska Department of Fish and Game. The proposed project is not located within either of these areas.

The Redoubt Bay Critical Habitat Area was founded in 1989 to ensure the protection and enhancement of fish and wildlife, particularly Tule geese. State lands, tidelands, and submerged lands are included in this area.

The Trading Bay State Game Refuge was established in 1976 to protect the following: fish and wildlife habitat, waterfowl nesting, feeding and migration, moose calving areas, spring and fall bear feeding areas, and salmon spawning and rearing habitats. The refuge includes state lands, tidelands, and submerged lands.

### 8.3 SUMMARY

Waste discharges associated with oil and gas production at the Osprey Platform in Cook Inlet are expected to be consistent with relevant ACMP policies. Discharges will be consistent with the objectives of subsistence uses of the coastal zone, management of coastal habitats, and management of specific habitat types (e.g., offshore areas). The project is currently undergoing a coastal zone management consistency review by the Alaska Division of Governmental Coordination to ensure that there are no conflicts with coastal zone management objectives.

# 9.0 MARINE WATER QUALITY CRITERIA

This section addresses compliance of oil and gas production discharges from the Osprey Platform with federal and State of Alaska water quality criteria and standards. Discharges to state waters in Cook Inlet must meet Alaska Water Quality Standards (18 AAC 70). For heavy metals, state standards are equivalent to federal water quality criteria. Compliance with these criteria must be met at the edge of the mixing zone. State policy allows discretionary determination of the size of mixing zones considering characteristics of receiving waters, effluents, and impacts on water quality.

Alaska marine water quality standards for the protection of aquatic life (18 AAC 70) include the following:

- Temperature: Discharges may not cause the weekly average temperature to increase more than 1ºC. The maximum rate of change may not exceed 0.5ºC per hour. Normal daily temperature cycles may not be altered in amplitude or frequency.
- Dissolved Inorganic Substances: Discharges may not increase the natural salinity by more than 4 parts per thousand (ppt) for waters with natural salinity between 13.5 to 35.0 ppt (as in the Forelands area of Cook Inlet).
- Sediment: Discharges may not cause a measurable increase in concentration of settleable solids above natural conditions, as measured by the volumetric Imhoff cone method.
- Toxics and Other Deleterious Organic and Inorganic Substances: Individual substances in the discharges may not exceed federal EPA Quality Criteria for Water (USEPA 1999b). There may be no concentrations of toxic substances in water or in shoreline or bottom sediments, that, singly or in combination, cause, or reasonably can be expected to cause, toxic effects on aquatic life, except as authorized. Substances may not be present in concentrations that individually or in combination impart undesirable odor or taste to fish or other aquatic organisms, as determined by either bioassay or organoleptic tests.
- Color: Color or apparent color may not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life. For all waters without a seasonally established nor for aquatic life, color or apparent color may not exceed 50 color units or the natural condition, whichever is greater.
- Petroleum Hydrocarbons, Oil and Grease: Total aqueous hydrocarbons in the water column may not exceed 15 µg/L. Total aromatic hydrocarbons in the water column may not exceed 10 µg/L. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.
- Radioactivity: The discharges may not exceed the concentration specified in the Alaska Drinking Water Standards (18 AAC 80).
- Total Residual Chlorine: Concentrations may not exceed 2.0 ug/L for salmonid fish, or 10.0 ug/L for other organisms.

- Residues: The discharges may not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. The discharges may not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

The Osprey Platform will not be authorized to discharge drilling muds, cuttings, or produced water. Discharges to state waters will include sanitary waste, domestic waste, deck drainage, non-contact cooling water, boiler blowdown, fire control system test water, and excess cement slurry.

The volume and concentrations of pollutants in the waste discharges from the Osprey Platform are expected to be minimal (SAIC 2001b). All discharges are expected to meet human health water quality criteria at the end-of-pipe, as well as water quality criteria for the protection of aquatic life. Therefore, there is little potential for discharges to exceed marine water quality criteria.

# 10.0 DETERMINATION OF UNREASONABLE DEGRADATION

Section 1 of this ODCE provides the regulatory definition of unreasonable degradation of the marine environment (40 CFR 125.12[e]) and indicates the ten criteria which are to be considered when making this determination (40 CFR 125.122). The actual determination of whether the discharge will cause unreasonable degradation is made by the U.S. EPA Regional Administrator. The intent of this chapter is to briefly summarize information pertinent to the determination of unreasonable degradation. Each of the ten criteria are discussed below.

## 10.1 CRITERION 1

**The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;**

- Deck drainage and non-contact cooling water represent relatively high volume discharges (e.g., over 100,000 gpd), however pollutant concentrations in these discharges (primarily oil and grease) are anticipated to be low.
- About 2,020 gpd of sanitary waste will be discharged from the Osprey Platform; pollutants include $BOD_5$, fecal coliform, suspended solids, and residual chlorine. Concentrations are anticipated to be low, however, and in accordance with Alaska water quality standards.
- The remaining discharges (domestic waste, boiler blowdown, fire control test water, and excess cement slurry) are low in volume or intermittent and/or contain minimal concentrations of contaminants.
- Due to the minimal pollutant concentrations and/or low volume of the discharges, the potential for bioaccumulation or persistence of contaminants is low.

## 10.2 CRITERION 2

**The potential transport of such pollutants by biological, physical, or chemical processes;**

- The Forelands area of Cook Inlet has been demonstrated to be a non-depositional, high-energy environment characterized by a cobble and sand bottom. Fast tidal currents and tremendous mixing produce rapid dispersion of the minimal concentrations of soluble and particulate pollutants. It is expected that pollutants in the sanitary and other waste streams will be dissipated to undetectable concentrations within a few feet of the discharge.

## 10.3 Criterion 3

**The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;**

- Low concentrations of BOD and nutrients in the sanitary waste discharge could stimulate primary productivity and enhance zooplankton production. This effect is predicted to be negligible.
- Threatened and endangered species that could occur near the project site include: Steller's eider, short-tailed albatross, fin whale, humpback whale, blue whale, northern right whale, and Steller sea lion. Most of these species are only occasional or accidental visitors to the Forelands area; they are unlikely to be affected by discharges from the Osprey Platform.
- A small number of Steller sea lions may occur near the project area, although no rookeries or haul-out areas have been identified in the project area. Wastewater discharges will be diluted by the strong tidal flux of Cook Inlet and are unlikely to adversely affect Steller sea lions or their critical habitat.
- Beluga whales have been identified as depleted under the Marine Mammal Protection Act. Belugas congregate at the mouths of rivers in Cook Inlet for calving and feeding; they disperse along the coastline of the upper and central inlet in late summer. Most belugas appear to move into the lower inlet during winter. The West Foreland area is not heavily used by beluga whales. Because the discharges will be rapidly dispersed, it is unlikely that they would directly or indirectly affect Cook Inlet belugas or their critical habitat.

## 10.4 Criterion 4

**The importance of the receiving water to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;**

- Anadromous fish migrate through Cook Inlet towards spawning habitat in rivers and streams, and juveniles travel through Cook Inlet toward marine feeding areas. The Susitna River drainage is a primary sources of these anadromous fish in Cook Inlet. Eulachon also return to spawn in some of the rivers. Because the waste discharges will be rapidly dispersed, it is unlikely that they would adversely affect migrating anadromous fish.
- Cook Inlet is an important area for marine mammals including beluga whales, Steller sea lions, and harbor seals. No harbor seal haulout areas have been identified in the vicinity of the West Foreland. No adverse impacts from the Osprey Platform waste discharges is predicted.
- Lower Cook Inlet is one of the most productive areas for seabirds in Alaska, with an estimated 100,000 seabirds; 18 species breed in Cook Inlet.

- Waterbirds and waterfowl breed in the Cook Inlet region. In the spring, large numbers of waterbirds migrate through the area. Large populations of staging waterfowl are found on tidal flats, along river mouths, and in bays on the west side of the inlet including Redoubt Bay. Redoubt Bay has particularly high concentrations of geese and ducks.
- Several waterfowl species occurring in Cook Inlet are of particular concern due to their limited breeding distribution, small population size, or use of critical habitats. These are: trumpeter swan, Tule white-fronted goose, and snow goose. Trumpeter swans and Tule white-fronted geese breed in Redoubt Bay.
- Due to the rapid dispersion of waste discharges from the Osprey Platform, no adverse impacts on birds are predicted.

### 10.5 Criterion 5

**The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;**

- Redoubt Bay Critical Habitat Area is located just south of the Osprey Platform along the west coast of Cook Inlet. During summer, it is the nesting ground of the Tule white-fronted goose as well as several tens of thousands of breeding ducks. Due to the relatively low volume and concentrations of waste discharges from the Osprey Platform, as well as their rapid dispersion, no adverse impacts on birds at the Redoubt Bay Critical Habitat Area is predicted.
- Trading Bay State Game Refuge is located about 6 miles north of the Osprey Platform. It was established to protect fish and wildlife habitat and populations, particularly waterfowl nesting, feeding, and migration areas; moose calving areas; spring and fall bear feeding areas; and salmon spawning and rearing habitats. Given the refuge’s distance from the Osprey Platform and the rapid dispersion of pollutants in the waste discharges, no adverse effects are predicted.
- No critical habitat for endangered or threatened species has been identified in the project area by the National Marine Fisheries Service.
- Two potential Areas Meriting Special Attention (AMSA) are located in the general area: the Chuitna Potential AMSA and the Nikiski Industrial Area. The proposed project is not located within either of these AMSAs.

### 10.6 Criterion 6

**The potential impacts on human health through direct and indirect pathways;**

- Wastewater discharges from the Osprey Platform are not predicted to result in significant impacts to human health due to the small volume and low concentration of pollutants in the discharges.

## 10.7 Criterion 7

**Existing or potential recreational and commercial fishing, including finfishing and shellfishing;**

- Nearshore locations used for commercial, subsistence, and recreational fisheries are predominantly outside areas that could conceivably be impacted by activities conducted during drilling and production at the Osprey Platform.

## 10.8 Criterion 8

**Any applicable requirements of an approved Coastal Zone Management Plan;**

- Waste discharges from the Osprey Platform are expected to be consistent with relevant Alaska Coastal Management Program policies and with the Kenai Peninsula Borough Coastal Management Program.

## 10.9 Criterion 9

**Such other factors relating to the effects of the discharge as may be appropriate;**

- No other factors have been identified relating to the effects of the discharge.

## 10.10 Criterion 10

**Marine water quality criteria developed pursuant to Section 304(a)(1).**

- The waste discharges from the Osprey Platform are expected to comply with all marine water quality criteria.

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# APPENDIX G

# CORRESPONDENCE WITH ADEC
# ON AIR QUALITY ISSUES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

AUG 21 2001

Reply To
Attn Of: OAQ-107

Mr. John Kuterbach, Chief
Air Quality Management
Alaska Department of Environmental Conservation
410 Willoughby Avenue, Suite 303
Juneau, Alaska 99801-1795

Re: Permitting of Forest Oil's Kustatan Production Facility and Osprey Platform Pursuant to the Alaska SIP

Dear Mr. Baumgartner:

Through the federal National Environmental Policy Act (NEPA) process, EPA has been evaluating the potential environmental consequences associated with Forest Oil's development of the Redoubt Shoal Unit. As you already know, development of the Redoubt Shoal Unit will require permitting of an off-shore platform, Osprey, and an on-shore production facility, Kustatan, for purposes of air quality protection. Our recently issued draft environmental assessment identifies Forest Oil's obligation to apply for an air quality construction permit from the Alaska Department of Environmental Conservation (ADEC). In fact, we are aware that Forest Oil submitted a revised PSD-avoidance permit application to you in July 2001, for Kustatan in responding to ADEC's finding that the original application was incomplete.

In ADEC's May 15, 2001, incompleteness letter to Forest Oil, ADEC expresses a concern that Kustatan and Osprey should be permitted together as one facility. We share ADEC's concerns as evidenced by our recent contribution to the NEPA process. See the enclosed August 17, 2001, EPA memorandum from me to Robert R. Robichaud, Manager, NPDES Permits Unit. For the reasons developed in the enclosed memorandum, it is our position that Kustatan and Osprey are one facility for the purposes of air quality construction permitting consistent with the Alaska SIP-approved PSD rules and EPA guidance. Based upon my most recent conversation you, we are in agreement on this position.

Please consider the enclosed memorandum and guidance as your office reviews Forest Oil's revised application for Kustatan. If you have any questions regarding the enclosed material, please contact Dan Meyer of my staff at 206.553.4150.

Sincerely,

Douglas E. Hardesty, Manager
Federal and Delegated Air Programs

Enclosures

cc: John Amundsen, Forest Oil
Jim Baumgartner, ADEC

Please consider the enclosed memorandum and guidance as your office reviews Forest Oil's revised application for Kustatan. If you have any questions regarding the enclosed material, please contact Dan Meyer of my staff at 206.553.4150.

Sincerely,

Douglas E. Hardesty, Manager
Federal and Delegated Air Programs

Enclosures

cc: John Amundsen, Forest Oil
Jim Baumgartner, ADEC

bcc: Marcia Combs, AOO
Matthew Harrington, OW-130
Jeff Kopf, ORC-158
Dan Meyer, OAQ-107
John Pavitt, AOO
Robert R. Robichaud, OW-130
Theodore Rockwell, AOO

| CONCURRENCES | | | | | | |
|---|---|---|---|---|---|---|
| **Initials:** | DM | | | | | |
| **Name:** | Dan Meyer | | | | | |
| **Date:** | 8/20/07 | | | | | |

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 10**
1200 Sixth Avenue
Seattle, WA 98101

AUG 21 2001

**MEMORANDUM**

SUBJECT: Forest Oil Kustatan Facility and Osprey Platform Construction Permitting Applicability Determination

FROM: Douglas E. Hardesty, Manager
Federal & Delegated Air Programs Unit (OAQ-107)

TO: Robert R. Robichaud, Manager
NPDES Permits Unit (OW-130)

The purpose of this memorandum is to communicate the Office of Air Quality's position regarding the air quality construction permitting of Forest Oil's Kustatan Facility (Kustatan) and Osprey Platform (Osprey). Both Kustatan and Osprey play vital roles in the Redoubt Shoal Unit Development Project in central Cook Inlet. In preparation for issuing an NPDES permit to Forest Oil for Osprey, Matthew Harrington of your staff is currently developing an environmental assessment (EA) to address potential environmental consequences associated with the development of the Redoubt Shoal Unit. In addition, the environmental assessment identifies the specific federal and state agencies under whose permit authorization mitigation measures for environmental impacts may be applicable.

Mr. Harrington has asked Dan Meyer of my staff to identify the applicable air quality construction permit requirements enabling the Alaska Department of Environmental Conservation (ADEC) to implement the mitigation measures related to air quality impacts. Specifically, Mr. Harrington asks whether or not Kustatan and Osprey should be permitted as one facility or two under the Alaska State Implementation Plan (SIP)-approved Prevention of Significant Deterioration (PSD) program. Mr. Harrington has provided Mr. Meyer with the following background information:

March 2001 Application for an Air Quality Construction Permit for the Forest Oil Corporation Kustatan Production Facility,

April 12, 2001, Draft Environmental Assessment for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and gas Development Project,

May 15, 2001, ADEC Notice of Incomplete Application to Forest Oil Corporation for the Kustatan Production Facility, and

July 2001 Revised Application for an Air Quality Construction Permit for the Forest Oil Corporation Kustatan Production Facility.

Based upon information provided in the records noted above, the Alaska SIP-approved PSD regulations, and EPA's PSD guidance documents, it is the position of the Office of Air Quality that the Kustatan and Osprey projects are one facility under the Alaska SIP-approved PSD regulations. Given that the development of the Redoubt Shoal Unit is intended to progress swiftly to production in a relatively short period of time, Kustatan and Osprey should be permitted together consistent with rule requirements and so as to avoid potential PSD circumvention.

Discussion

The scope of the proposed Redoubt Shoal Unit development, according to the April 12, 2001, draft EA, includes the following components:

- Conversion of the Osprey Platform from a manned exploratory platform to a minimally-manned production platform.
- Production drilling operations using freshwater-based and oil-based drilling fluids. Drilling muds and cuttings will be disposed of with on-platform grind and injection facilities.
- Construction of a new oil production facility located at Kustatan on the West Forelands for oil separation, platform power generation, and produced water treatment for reinjection offshore.
- Transportation of crude oil and natural gas from the Redoubt Shoal Unit to the new oil production facility.
- Transportation of the crude oil from the new oil production facility to existing facilities onshore (through the Trading Bay Production Facility).

Osprey is located 1.8 miles southeast of the tip of the West Forelands off-shore in central Cook Inlet. Formerly an exploratory drilling operation, Osprey will soon be converted to an oil and gas production platform. The oil and gas produced by Osprey will be processed on-shore at Kustatan approximately 4.5 kilometers (2.8 miles) away.

According to the July 2001 Revised Application for an Air Quality Construction Permit for Kustatan,

> *No industrial activity currently occurs at the [Kustatan] facility location. Exploratory drilling was conducted in November and December 2000. One well was drilled. Production quantities of petroleum were not found and the drilling operation was discontinued.*

*The proposed operation will collect produced liquids and gas from Forest Oil's Osprey Platform, separate the oil, produced water, and natural gas, and transfer the oil and natural gas to Forest Oil's West MacArthur River Production Facility.*

According to 18 Alaska Administrative Code (AAC) 50.900(21) and (41) of the Alaska SIP, approved February 16, 1995, 60 Fed. Reg. 8943,

*"facility" means pollutant-emitting sources or activities which are located on one or more contiguous or adjacent properties and which are owned or operated by the same person or by persons under common control; and*

*"source" means a structure, building, installation, or other part of a facility which emits or may emit a regulated air pollutant*[1].

Both Kustatan and Osprey are individually considered "sources" given that each will contain equipment that emits regulated air pollutants. In order for Kustatan and Osprey to be considered one facility, two elements of the "facility" definition must be satisfied. Namely,

1. Kustatan and Osprey must be located on one or more contiguous or adjacent properties, and
2. Kustatan and Osprey must be owned or operated by the same person or by persons under common control.

It is our understanding that ADEC has not yet made a final determination whether or not to classify the two sources as one facility. ADEC reviewed the March 2001 Application for an Air Quality Construction Permit for the Forest Oil Corporation Kustatan Production Facility, and ADEC provided comments to Forest Oil in a May 15, 2001, letter. As indicated in the letter, the application did not include emissions from Osprey. ADEC noted,

*It appears that the Kustatan Facility and Osprey platform are a single facility as defined in AS 46.14.990.(9) As such, Forest Oil should determine facility classification based on combined emission rates.*

Forest Oil responded to these comments in a July 20, 2001, letter to ADEC accompanying its July 2001 Revised Application for an Air Quality Construction Permit for the Forest Oil Corporation Kustatan Production Facility. Forest Oil stated,

*Forest Oil is the owner of both the proposed Kustatan Production Facility and the Osprey Platform. Pipeline and electrical and communications cables will span*

[1]EPA's regulations relating to the requirements for a State to obtain a SIP-approved PSD program requires that a State's definition of "facility" or "source" must be more stringent or at least as stringent, in all respects to the EPA definitions provided in the regulations. See 40 C.F.R. §51.165(a)(1).

*the distance between the two facilities. However, the two properties are approximately 4.5 kilometers distant from each other. Forest Oil does not own the land between the Osprey Platform and the Kustatan Production Facility. The intervening terrain is Cook Inlet. The State of Alaska owns the land under that water body.*

There is no dispute that Kustatan and Osprey are under the common control of Forest Oil and thus satisfy the "common control" element of the "facility" definition. However, Forest Oil disputes that Kustatan and Osprey are "contiguous or adjacent" as noted in its response to ADEC.

*The "common sense" notion of plant dictates that these two facilities are not contiguous or adjacent and should be treated independently for permitting purposes."*

Forest Oil refers to a "common sense" notion of plant, which is a reference to the preamble to EPA's August 7, 1980, final PSD rulemaking in the *Federal Register,* 45 Fed. Reg. 52695; however, Forest Oil, does not evaluate how this "common sense" notion applies to the different elements of the Kustatan - Osprey relationship (ie. the distance between Kustatan and Osprey, or the support facility relationship between the two.) The preamble to the August 1980 FR, in addition to other EPA guidance documents, however, do provide further guidance related to the "common sense" notion of whether two facilities are contiguous or adjacent. With respect to the definition of source [facility for purposes of the Alaska SIP], EPA states,

*(1) it must carry out reasonably the purposes of the PSD; (2) it must approximate a common sense notion of "plant"; and (3) it must avoid aggregating pollutant-emitting activities that as a group would not fit within the ordinary meaning of "building," "structure," "facility," or "installation." Each source is to be classified according to its primary activity, which is determined by its principle product or group of products produced or distributed, or service rendered. Thus one source classification encompasses both primary and support facilities, even when the latter includes units with a different two-digit SIC code. (emphasis added)*

45 Fed. Reg. 52694 and 52695.

More specifically, with respect to the concept of "contiguous or adjacent", EPA states,

*EPA has stated in the past and now confirms that it does not intend "source" to encompass activities that would be many miles apart along a long-line operation. For instance, EPA would not treat all of the pumping stations along a multistate pipeline as one "source." EPA is unable to say precisely at this point how far apart activities must be in order to be treated separately. The Agency can answer that question only through case-by-case determinations.*

45 Fed. Reg. 52695.

EPA Region 8, with the assistance of EPA's Office of Air Quality Planning and Standards and Office of General Counsel, provided guidance to the State of Utah concerning multi-source aggregation for purposes of air quality construction permitting. in formulating the guidance. The May 21, 1998, guidance document (Utility Trailer - attachment) utilizes previous EPA determinations to assist Utah in determining whether or not to aggregate two sources under common control but separated by about a mile. The guidance suggests that the determination include an evaluation of whether the distance between the two facilities is sufficiently small to enable them to operate as a single source. The evaluation questions proposed by Region 8 are transposed here with responses specific to the facts surrounding Kustatan and Osprey:

*1. Was the location of he new facility chosen primarily because of its proximity to the existing facility, to enable the operation of the two facilities to be integrated? In other words, if the two facilities were sited much further apart, would that significantly affect the degree to which they may be dependent on each other?*

Forest Oil chose to construct the Kustatan production unit at the former Tomcat drill site in West Foreland, 2.8 miles from Osprey, for a number of reasons. Utilization of the old Tomcat drill site avoids any further disturbance of wetlands, archaeological sites, and other surrounding properties while utilizing existing assets. Regardless of the specific location of the production facility in West Foreland (or outside West Foreland for that matter), the platform and production unit operate as one facility as each is exclusively dependent upon the other as illustrated in response to item 4. below.

*2. Will materials be routinely transferred between the facilities? Supporting evidence for this could include a physical link or transportation link between the facilities, such as a pipeline, railway, special-purpose or public road, channel or conduit.*

To enable such an integrated operation, Kustatan and Osprey are physically connected by the following equipment: a) pipelines to transport the oil/gas/produced water from Osprey to Kustatan and to transport the treated produced water from Kustatan to Osprey, b) electrical cables to provide Osprey with power generated at Kustatan, and c) communication cables to coordinate efforts between the two.

*3. Will managers or other workers frequently shuttle back and forth to be involved actively in both facilities? Besides production line staff, this might include maintenance and repair crews, or security or administrative personnel.*

During the production phase of the project (20 years), the project will support 10-full time employees according to the draft EA (page 4-50). It is anticipated that Osprey will require up to 5 employees per hitch, and onshore personnel from Kustatan will also work at the West McArthur River Unit (West McArthur). Personnel from Kustatan and West McArthur will be utilized at Osprey to perform maintenance activities as required.

*4. Will the production process itself be split in any way between the facilities, i.e., will one facility produce an intermediate product that requires further processing at the other facility, with associated air pollutant emissions? For example, will components be assembled at one facility but painted at the other?*

Osprey relies upon Kustatan to process all the platform's product into marketable oil and gas while separating and treating the produced water. Once treated, the produced water is piped back to Osprey and is then reinjected off-shore by Osprey. Kustatan also provides power generation to Osprey. Thus, after considering the factors relevant to determining whether Kustatan and Osprey are "contiguous or adjacent," we conclude that they are adjacent facilities within the federal definition of "source" and consequently under the definition of "facility" under the Alaska SIP-approved PSD regulations.

Conclusion

The Office of Air Quality concludes that because Kustatan and Osprey are located on adjacent properties and are owned or operated by the same person under common control, they should be considered one facility under the Alaska SIP-approved PSD regulations. If you have any questions regarding this determination, please contact Dan Meyer of my staff at 206.553.4150.

Attachment

cc: Marcia Combs, AOO
Matthew Harrington, OW-130
Jeff Kopf, ORC-158
Dan Meyer, OAQ-107
John Pavitt, AOO
Theodore Rockwell, AOO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

May 21, 1998

Ref: 8P2-A

Lynn Menlove, Manager
New Source Review Section
Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, UT 84114-4820

Re: Response to Request for Guidance in Defining Adjacent with Respect to Source Aggregation

Dear Mr. Menlove:

This is in response to your letter of January 15, 1998, to Mike Owens of my staff, requesting guidance and/or specific recommendations in the matter of Utility Trailer Manufacturing Company. For the purpose of determining if two Utility Trailer facilities should or should not be aggregated into a single source under Clean Air Act Title V and New Source Review permitting programs, you asked what is the specific physical distance associated with the definition of "adjacent." The word "adjacent" is part of the definition of "source" in the Utah SIP regulations, at R307-1-1. The SIP definition follows the Federal definition found in 40 CFR 51.166.

In brief, our answer is that the distance associated with "adjacent" must be considered on a case-by-case basis. This is explained in the preamble to the August 7, 1980 PSD rules, which says "EPA is unable to say precisely at this point how far apart activities must be in order to be treated separately. The Agency can answer that question only through case-by-case determinations." After searching the New Source Review Guidance Notebook, and after querying the other Regions and EPA's Office of Air Quality Planning and Standards, we have found no evidence that any EPA office has ever attempted to indicate a specific distance for "adjacent" on anything other than a case-by-case basis. We could not find any previous EPA determination for any case that is precisely like Utility Trailer, i.e., two facilities under common control, with the same primary 2-digit SIC code, located about a mile apart, both producing very similar products, but claimed by the company to be independent production lines.

Utah SIP regulations do not define "adjacent." The definition in the 1995 edition of Webster's New College Dictionary is: 1. Close to; nearby, or 2. Next to; adjoining. We realize this leaves considerable gray area for interpretation; however, since the term "adjacent" appears in the Utah SIP as part of the definition of "source," any evaluation of what is "adjacent" must relate to the guiding principle of a common sense notion of "source." (The phrase "common sense notion" appears on page 52695 of the August 7, 1980 PSD preamble, with regard to how to define "source.") Hence, a determination of "adjacent" should include an evaluation of whether the distance between two facilities is sufficiently small that it enables them to operate as a single "source." Below are some types of questions that might be posed in this evaluation, as it pertains to Utility Trailer. Not all the answers to these questions need be positive for two facilities to be considered adjacent.

-- Was the location of the new facility chosen primarily because of its proximity to the existing facility, to enable the operation of the two facilities to be integrated? In other words, if the two facilities were sited much further apart, would that significantly affect the degree to which they may be dependent on each other?

-- Will materials be routinely transferred between the facilities? Supporting evidence for this could include a physical link or transportation link between the facilities, such as a pipeline, railway, special-purpose or public road, channel or conduit.

-- Will managers or other workers frequently shuttle back and forth to be involved actively in both facilities? Besides production line staff, this might include maintenance and repair crews, or security or administrative personnel.

-- Will the production process itself be split in any way between the facilities, i.e., will one facility produce an intermediate product that requires further processing at the other facility, with associated air pollutant emissions? For example, will components be assembled at one facility but painted at the other?

One illustration of this type of evaluation involved Great Salt Lake Minerals in Utah, which we wrote to you about on August 8, 1997, in response to your inquiry. (See enclosure #1.) We recommended, as EPA guidance, that you treat the two GSLM facilities as a single source (i.e., "adjacent"), despite the fact that they are a considerable distance apart (21.5 miles). We based that advice on the functional inter-relationship of the facilities, evidenced in part by a dedicated channel between them. We wrote that the lengthy distance between the facilities "is not an overriding factor that would prevent them from being considered a single source."

Another illustration is ESCO Corporation in Portland, Oregon, which operates two metal casting foundries (a "Main Plant" and a "Plant 3"), a couple of blocks apart. All castings produced by foundries at both facilities are coated, packaged and shipped at the "Main Plant". EPA Region 10 wrote to the State of Oregon on August 7, 1997 (see enclosure #2), that the guiding principle in evaluating whether the two facilities are "adjacent" is "the common sense notion of a plant. That is, pollutant emitting activities that comprise or support the primary product or activity of a company or operation must be considered part of the same stationary source." EPA determined that the two ESCO facilities must be considered a single major stationary source, since they function together in that manner, even though the Plant 3 foundry operates independently from the Main Plant foundry.

Another illustration is Anheuser-Busch in Fort Collins, Colorado, which operates a brewery and landfarm about six miles apart. A memo from OAQPS to our Regional Office, dated August 27, 1996 (see enclosure #3), stated that with regard to "contiguous or adjacent," the facilities should be treated as one source, due to their functional inter-relationship (landfarm as an integral part of the brewery operations), evidenced in part by a disposal pipeline between them. The fact that they are a considerable distance apart "does not support a PSD determination that the brewery proper and the landfarm constitute separate sources for PSD purposes."

Another illustration is Acme Steel Company, which operates an integrated steel mill consisting of coke ovens and blast furnaces at a site in Chicago, Illinois, along with basic oxygen furnaces, casting and hot strip mill operations at a site in Riverdale, Illinois, about 3.7 miles away. The blast furnace in Chicago produces hot metal that is transported via commercial rail to the BOF shop in Riverdale for further processing into steel. EPA Region 5 wrote to the State of Illinois on March 13, 1998 (see enclosure #4), that "Although the two sites are separated by Lake Calumet, landfills, I-94, and the Little Calumet River, USEPA considers that the close proximity of the sites, along with the interdependency of the operations and their historical operation as one source, as sufficient reasons to group these two facilities as one."

Therefore, in the matter of Utility Trailer, we recommend you evaluate, using questions such as those we posed above, whether the two facilities (one existing and one proposed for construction) will, in fact, operate independently of each other, as the company has claimed. Athough Utility Trailer writes that "The present facility is not capable of conversion to the new trailer manufacturing process," they also write that the existing facility is "an inefficient manufacturing process which has made this facility less cost-competitive." This suggests to us the possibility that the existing facility could become a support facility for the new one. The company should be advised that if the two facilities are later discovered by the State and/or EPA to be actually operating as a single major source, and no Title V or PSD permit applications have been submitted where required by regulation, the company could become subject to State or EPA enforcement action or citizen suit.

Finally, please be aware that if the facilities are treated as two separate sources, no emission netting between them can be allowed, to avoid major source NSR permitting at either facility, in the event of future facility modifications.

We hope this letter will be helpful. It has been written only as guidance, as it remains the State's responsibility to make source aggregation determinations under EPA-approved State programs and regulations. This letter has been reviewed by specialists at OAQPS, by our Office of Regional Counsel, and by Office of General Counsel at EPA Headquarters. We apologize for the delay in getting our response to you.

If you have questions, please contact Mike Owens. He is at at (206) 553-6511 until late June, after which he may be reached at (303) 312-6440.

Sincerely,

Richard R. Long
Director
Air Program

Enclosures (4)

cc: Rick Sprott, Utah DAQ
Scott Manzano, Utah DAQ
Jose Garcia, Utah DAQ

# Phone Record

## November 27, 2001

Jim Baumgartner, Supervisor of the Construction Air Permit Program of the Alaska Department of Environmental Conservation (ADEC), left a voicemail with John Matthew Harrington, EPA NEPA Compliance Coordinator, on November 27, 2001. Mr. Baumgartner stated that the ADEC Air Construction Permit program intends to issue two synthetic minor permits for the Forest Oil project (one minor permit for the Osprey Platform and one minor permit for the onshore Kustatan Production facility). Mr. Baumgartner further stated that it would be acceptable to him for EPA to use a phone record of his message on the permitting decision for public disclosure purposes in the Environmental Assessment (EA).

From: "Baumgartner, Jim" <Jim_Baumgartner@envircon.st
Sent: 12/19/2001 09:24 AM
To: Matthew Harrington/R10/USEPA/US@EPA
cc: "Baumgartner, Jim" <Jim_Baumgartner@envircon.state.ak.us>,
"Schuler, Alan" <Alan_Schuler@envircon.state.ak.us>

Subject: FW: Kustatan OCD Analysis

Matt,

The ambient impact analysis for the Kustatan Production Facility is being reviewed and is approvable. We'll send you a courtesy copy of our review memorandum when it is completed.

JimB

-----Original Message-----
From: Schuler, Alan [mailto:Alan_Schuler@envircon.state.ak.us]
Sent: Tuesday, December 18, 2001 4:23 PM
To: 'John Amundsen'
Cc: Siddeek, Fathima; Baumgartner, Jim; Schuler, Alan; 'Al Trbovich (Hoefler)'

Subject: RE: Kustatan OCD Analysis

John,

With the revised OCD run that Al provided today, I now have everything that I need for the ambient analysis of the Kustatan Production Facility. I've already looked over the revised run and have concluded that Forest Oil has adequately demonstrated that they can comply with the NO2 NAAQS and Increment. The CO analysis was not required, but it too adequately demonstrates compliance with the CO NAAQS.

I will try to formally write-up my findings before I head out on annual leave this Thursday afternoon. However, if I'm unable to, this e-mail documents my basic conclusion that the ambient analysis is fine.

Therefore, Jim and Zeena may continue processing the rest of Forest Oil's application without concern of potential changes associated with the ambient analysis.

Alan