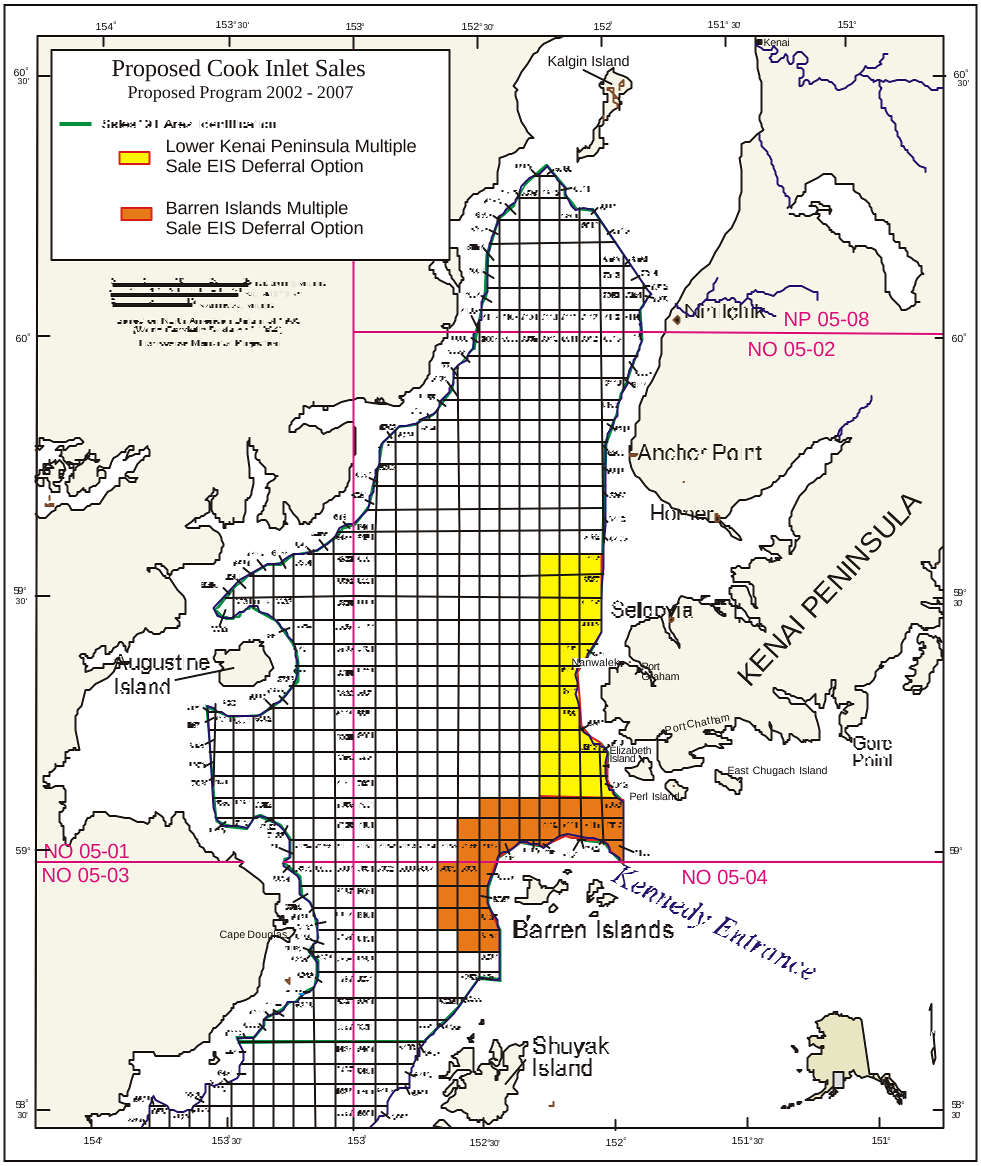
OCS Report
MMS 2002-074

Oil-Spill Risk Analysis: Cook Inlet Planning Area, OCS Lease Sales 191 and 199



MMS
U.S. Department of the Interior
Minerals Management Service
Environmental Division

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Oil-Spill Risk Analysis: Cook Inlet Planning Area, OCS Lease Sales 191 and 199

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U.S. Department of the Interior
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Introduction

The Federal Government plans to offer U.S. Outer Continental Shelf (OCS) lands in the Cook Inlet Planning Area for oil and gas leasing. Because oil spills may occur from activities associated with offshore oil exploration, production, and transportation resulting from these lease sales, the Minerals Management Service (MMS) conducts a formal oil-spill risk analysis (OSRA) to support the environmental impact statement (EIS) completed prior to conducting the proposed leasing of this area. This report summarizes results of that analysis, the objective of which was to estimate the risk of oil-spill contact to sensitive offshore and onshore environmental resources and socioeconomic features from oil spills accidentally occurring from the OCS activities.

The occurrence of oil spills is fundamentally a matter of probability. There is no certainty regarding the amount of oil that would be produced, or the size or likelihood of a spill that would occur, during the estimated life of a given lease sale. Neither can the winds and ocean currents that transport oil spills be known for certain. A probabilistic event such as an oil-spill occurrence or oil-spill contact to an environmentally sensitive area cannot be predicted, only an estimate of its likelihood (its probability) can be quantified.

The OSRA was conducted in three parts corresponding to different aspects of the overall problem.

(1) the probability of oil-spill occurrence, which is based on spill rates derived from historic data and on estimated volumes of oil produced and transported;
(2) the trajectories of oil spills from hypothetical spill locations to locations of various environmental resources, which are simulated using the OSRA Model (Smith et al., 1982); and
(3) the combination of results of the first two to estimate the overall oil-spill risk if there is oil development.

This report will be available from MMS's Internet site (*http://www.mms.gov/itd/index.htm*).

Summary of the Proposed Action

The proposed action is to lease OCS lands in the Cook Inlet Planning Area. As shown in figure 1, the study area for this analysis (which extends from latitudes 55.5^{o} N. to 61.0^{o} N. and from longitudes 147.0^{o} W. to 160.2^{o} W.) defines the geographic boundaries that encompass the environmental resources at risk from a hypothetical oil spill from OCS operations in the lease areas.

The lease sale area was divided into 7 hypothetical launch areas (fig. 1). These launch areas (LA1-LA7) reflect the technological requirements and related physical and economic impacts as a consequence of the oil and gas potential, exploration and development activities, and lease terms unique to each.

The transportation scenario assumes that the crude oil produced in LA1 through LA7 will be transported by pipeline to shore with potential landfalls locations chosen based on educated guesses (fig.2). These hypothetical offshore pipeline route segments (P1-P6) are used to represent spill risks from oil transportation.

Summary of the Alternatives

Only alternatives that were judged to be "economic" were analyzed in the OSRA. The two alternatives analyzed are the Barren Islands Deferral Area (fig. 3) and the Lower Kenai Deferral Area (fig. 4). These alternatives were analyzed by using the conditional and combined probabilities (representing oil-spill occurrence and contact) relevant to those portions of the hypothetical launch areas that overlay the respective areas.

Framework of the Analysis

The OSRA depends not only on the meteorological and geographical conditions of the study area but also on the environmental resources that are at risk and the estimated volumes of oil resources that are assumed to be discovered, produced, and transported. For purposes of this analysis, we assume that the oil will be recovered as a result of a single development, which may result from either Sale 191 or 199 or from both sales.

Hypothetical Spill Locations

The OSRA Model initiated hypothetical oil spills uniformly in space and time from within each launch area, as shown in figure 1. At one-fifteenth-degree intervals in the north-south direction (about 7.5 km) and one-fifth-degree intervals in the east-west direction (about 7.6 km), the model launched an oil spill every 1 day. At this resolution, there were 991 total launch points in space spread over 7 hypothetical launch areas and an additional 600 launch points along 6 pipeline segments. A total of 3,240 oil-spill trajectories were launched from each spatial point over a period of 9 years (1,620 in winter and 1,620 in summer). The spatial resolution of the spill simulations was well within the spatial resolution of the input data, and the interval of time between releases was sufficiently short to sample weather-scale changes in the input winds (Price et al., 2002).

The sensitivity tests on the OSRA Model (Price et al., 2002) indicated that, statistically, the above-mentioned spatial resolution and time resolution are sufficient to represent the spatial and time variations of the particle trajectories in the area.

Environmental Resources

The 31 environmental resources considered in this analysis were selected by MMS analysts in the Alaska OCS Region. The analysts used geographic digital information on the biological, physical, and socioeconomic resources that could be exposed to contact from OCS oil spills to create maps of resource locations vulnerable to oil-spill impact. These maps (figs. A-1 through A-5) depict locations to be analyzed by the OSRA Model, representing either the locations of onshore environmental resource habitats or the surface waters overlying or surrounding offshore environmental features.

A list of the environmental resources and socioeconomic features examined in this OSRA and the figures illustrating their locations are shown below.

Listing of Environmental Resources	**Figure**
Tuxedni Bay	A-1
Chinitna Bay	A-3
Outer Kachemak Bay	A-1
Outer Kamishak Bay	A-2
Inner Kamishak Bay	A-2
Barren Islands	A-2
Cape Douglas	A-4
Shuyak Island	A-3
Hallo/Kukak Bays	A-1
Kupreanof Strait	A-2
Katmai Bay	A-3
Puale Bay	A-1
Middle Cape	A-2
Sutwik Island	A-1
Chignik Bay	A-4
Semidi Islands	A-3
Chirikof Island	A-4
Trinity Islands	A-2
Twoheaded Island	A-4
South Albatross Bank	A-1
Ugak Bay	A-2
Cape Chiniak	A-1
North Albatross Bank	A-3
Marmot Island	A-1
Portlock Bank	A-4
Pye Islands	A-3
Forelands	A-2
South Kalgin	A-3
South Shelikof Strait	A-4
Marmot/Chiniak Bay	A-4
Kachemak Bay/Outer Peninsula	A-4

All onshore, coastal environmental resource locations were represented by one or more partitions of the coastline, herein called land segments (fig. 5). To create these land segments, the study area coastline was divided into 97 equidistant land segments of approximately 15-mile (25-km) lengths. The partitions were formed by creating straight lines between two points projected onto the coast; therefore, the actual miles of shoreline represented by each land segment may be greater than 15 miles, depending upon the complexity of the coastal area.

Estimated Volume of Oil Resources

For this analysis, both benefits and risks are functions of the volume of oil and are mutually dependent. For example, greater volumes of oil are associated with greater economic benefits as well as greater risks. If the benefits are evaluated by assuming production of a specific amount of oil, then the corresponding risks should be stated conditionally, such as "the risks are . . . , given that the volume is . . . ." Any statements about the likelihood of a particular volume of oil being developed also apply to the likelihood of the corresponding benefits and risks.

The projected life for a proposed lease sale in the study area is assumed to be 30 years (2004-2034). This is based on averages for time required for exploration, development, production life, and abandonment for leases. The projected oil production estimates (in billion barrels [Bbbl]) for the proposed lease sale are as follows (for purposes of this analysis, we assume that the oil will be recovered as a result of a single development, which may result from either Sale 191 or 199 or from both sales):

Proposed Action	Estimated Production (Bbbl)	Analysis Period
Proposed Action	0.140	30 years
Lower Kenai Deferral Area	0.126	30 years
Barren Islands Deferral Area	0.126	30 years

Oil-Spill Risk Analysis

The OSRA was conducted in three parts corresponding to different aspects of the overall problem: (1) the probability of oil-spill occurrence, (2) the trajectories of oil spills from hypothetical spill locations to various environmental resources, and (3) a combination of the first two to estimate the overall oil-spill risk of combined occurrence and contact if there is oil development.

Risk analyses may be characterized as "hazard-based" or "risk-based." A hazard-based analysis examines possible events regardless of their low (or high) likelihood. For example, a potential impact would not lose significance because the risk has been reduced due to an increase in the level of control, such as engineering standards. A risk-based analysis, on the other hand, does take into account the likelihood of the event occurring or the measures that can be taken to mitigate against its potential impacts.

This OSRA is designed for use as a risk-based assessment. Therefore, the likelihood of oil spills ($\geq$ 1,000 bbl in size) occurring on the OCS plays an integral role in the analysis. In addition to the estimated chance of spills occurring, the analysis entails an extensive oil-spill trajectory model. Results from the trajectory analysis provide input to the final product by estimating, given spill occurrence, where spills might travel on the ocean's surface and what resources might be contacted. Results from the final step of the OSRA are, therefore, expressed as the combined probability of spills both occurring and contacting offshore environmental resource locations. Note that the analysis estimates spill contacts, not impacts. Further measures that should be evaluated to determine impacts, such as the natural weathering of oil spills and cleanup activities, are not directly factored into the analysis, but should be added to the interpretation of its results.

Probability of Oil Spills Occurring

The probability of oil spills occurring assumes that spills occur independently of each other as a Poisson process. The Poisson process is a statistical distribution commonly used to model random events. The probability of oil spills occurring is based on spill rates derived from past U.S. Outer Continental Shelf and worldwide platform and pipeline spill experiences, and depends on the volume of oil produced and transported. All types of accidental spills greater than or equal to 1,000 bbl were considered in this analysis. These spills include not only well blowouts but also other accidents that occur on platforms and during transportation of oil to shore. These accidents were classified as either platform or pipeline spills. This classification allows the analyst to compare the risks from each spill source between a proposed action and any alternatives.

Anderson and LaBelle (1994, 2000) examined oil-spill occurrence rates applicable to the U.S. Outer Continental Shelf. Their results, adjusted for recent experience and based upon more complete databases than were available for earlier analyses (Anderson and LaBelle, 1990; Lanfear and Amstutz, 1983), indicated some significant changes in the spill rates for platforms and pipelines. In addition, they developed estimated occurrence rates for tanker spills that have occurred in U.S. waters. This report uses the updated spill occurrence rates.

Spill rates are expressed as number of spills per billion barrels (spills/Bbbl), defined as 10^9 bbl, of oil produced or transported. Only spills greater than or equal to 1,000 bbl are addressed because smaller spills may not persist long enough to be simulated by trajectory modeling. Another consideration is that a large spill is likely to be identified and reported; therefore, these records are more comprehensive than those of smaller spills. (Smaller spills are addressed in the EIS for each proposed action without the use of trajectory modeling.) In summary, the spill rates used in this report are as follows:

Spill Source	Spill Rate (Spills/Bbbl)
OCS Platforms	0.13
OCS Pipelines	1.38
All Sources	1.51

Two basic criteria were used in selecting volume of oil handled as the risk exposure variable: (1) the exposure variable should be simple to define, and (2) it should be a quantity that can be estimated. The volume of oil produced or transported was the chosen exposure variable primarily for the following reasons: (1) historic volumes of oil produced and transported are well documented; (2) using these volumes makes the calculation of the estimated oil-spill occurrence rate simple—the ratio of the number of historic spills to the volume of oil produced or transported;

and (3) future volumes of oil production and transportation are routinely estimated. Estimates of volume to be developed for a proposed action, which were prepared by analysts in the MMS Resource Evaluation Division, Alaska Regional Office, are derived from the assessment of oil resources by using comprehensive geological and geophysical databases and related models. In addition, the MMS analysts estimate other exposure variables, such as number of platforms, as a function of the volume of oil produced or transported.

Using Bayesian techniques, Devanney and Stewart (1974) showed that the probability of *n* oil-spill contacts can be described by a negative binomial distribution. Smith et al. (1982), however, noted that when actual exposure is much less than historical exposure, as is the case here, the negative binomial distribution can be approximated by a Poisson distribution. The Poisson distribution has a significant advantage in calculations because it is defined by only one parameter, the assumed number of spills. If $p(n,i)$ is the probability of exactly *n* contacts to environmental resource *i*, then:

$$p(n,i) = \frac{l_i^n \cdot e^{-li}}{n!}$$

where *n* is the specific number of spills (0, 1, 2, ..., *n*), *e* is the base of the natural logarithm, and ? is the parameter of the Poisson distribution. For oil spills, the Poisson parameter (?) is equal to the spill rate multiplied by the volume of oil to be produced or transported. The spill rate has dimensions of number of spills/Bbbl, and the volume is expressed in Bbbl. Therefore, ? denotes the mean number of spills estimated to occur as a result of production or transportation of a specific volume of oil.

Oil-spill occurrence estimates for spills greater than or equal to 1,000 bbl were calculated for production and transportation of oil during the 30-year analysis period associated with the proposed actions in the Cook Inlet Planning Area (2004-2034). These probabilities are based on the volume of oil assumed to be found, produced, and transported over the production life of the lease and on the rates that have been calculated for oil spills from OCS platforms and pipelines. The probabilities of one or more oil spills greater than or equal to 1,000 bbl occurring as a result of OCS production and transportation resulting from the proposed lease sale or deferral areas are found in table 1.

Oil-Spill Trajectory Simulations

The OSRA Model, originally developed by Smith et al. (1982) and enhanced by MMS over the years (LaBelle and Anderson, 1985; Price et al., 2002), simulates oil-spill transport using realistic data fields of winds and ocean currents in the Beaufort Sea. An oil spill on the ocean surface moves around by the complex surface ocean currents exerting a shear force on the spilled oil from below. In addition, the prevailing wind exerts an additional shear force on the spill from above, and the combination of the two forces causes the transportation of the oil spill away from its initial spill location. In the OSRA Model, the velocity of a hypothetical oil spill is the linear superposition of the surface ocean current and the wind drift caused by the winds. The model calculates the movement of hypothetical spills by successively integrating time sequences of two spatially gridded input fields: the surface ocean currents and the sea-level winds, both of which were generated by other computer models using many observations of relevant physical parameters. In this fashion, the OSRA Model generates time sequences of hypothetical oil-spill locations–essentially, oil-spill trajectories.

At each successive time step, the OSRA Model compares the location of the hypothetical spills against the geographic boundaries of shoreline and designated offshore environmental resources. The model counts the occurrences of oil-spill contact to these areas. Finally, the frequencies of oil-spill contact are computed for designated oil-spill travel times (e.g., 3, 10, and 30 days) by dividing the total number of oil-spill contacts by the total number of hypothetical spills initiated in the model from a given hypothetical spill location. The frequencies of oil-spill contact are the model-estimated probabilities of oil-spill contact. The OSRA Model output provides the estimated probabilities of contact to all identified offshore environmental resources and segments of shoreline from locations chosen to represent hypothetical oil spills from oil production and transportation facilities, at several selected oil-spill travel times.

There are factors not explicitly considered by the OSRA Model that can affect the transport of spilled oil as well as the dimensions, volume, and nature of the oil spills contacting environmental resources or the shoreline. These include possible cleanup operations, chemical or biological weathering of oil spills, or the spreading and splitting of oil spills. The OSRA analysts have chosen to take a more environmentally conservative approach by presuming persistence of spilled oil over the selected time duration of the trajectories.

In the trajectory simulation portion of the OSRA Model, many hypothetical oil-spill trajectories are produced by numerically integrating a temporally and spatially varying ocean current field and superposing on that an empirical wind-induced drift of the hypothetical oil spills (Samuels et al., 1982). Collectively, the trajectories represent a statistical ensemble of simulated oil-spill displacements produced by a field of winds derived from observations and numerically derived ocean currents. The winds and currents are assumed to be statistically similar to those that will occur in Cook Inlet during future offshore activities. In other words, the analysts assume that the frequency of strong wind events in the wind field is the same as what will occur during future offshore activities. By inference, the frequencies of contact by the simulated oil spills are the same as what could occur from actual oil spills during future offshore activities.

The other portion of the OSRA Model tabulates the contacts by the simulated oil spills. The model contains the geographical boundaries of a variety of identified environmental features. The shoreline segments proximate to their locations identify onshore resources. Offshore resources are identified by the area of surface waters overlying their locations. At every integration time step, the OSRA Model monitors the locations of the simulated spills and counts the number of oil-spill contacts to segments of shoreline and the locations of onshore and offshore environmental resources. A contact to shore will stop the trajectory of an oil spill; no rewashing is assumed in this model. However, contacts to the transparent (nonland) offshore resources will not stop the respective trajectories. After specified periods of time, the OSRA Model will divide the total number of contacts to the coastline segments and the environmental resources by the total number of simulated oil spills from a given geographic location. These ratios are the estimated probabilities of oil-spill contact from offshore activities at that geographic location, assuming spill occurrence.

Trajectories are constructed from simulations of tidal, wind-driven and density-induced flow fields. The basic approach is to simulate these time and spatially dependent currents separately, then to combine them through linear superposition to produce an oil-transport vector. This vector is then used to create a trajectory. Simulations are carried out for two seasons, winter (October-March) and summer (April-September). The choice of this seasonal division was based on meteorological, climatological, and biological cycles, as well as consultation with Alaska Region EIS analysts. Brief summaries of the methods and assumptions are given below.

Each trajectory is constructed using vector addition of the ocean current field and 3.5 percent of the instantaneous wind field—a method based on work done by Huang and Monastero (1982), Smith et al. (1982), and Stolzenbach et al. (1977). Equation 1 shows the components of motion that are simulated and used to describe the oil transport:

$$\mathrm{U}_{oil} = U_{current} + 0.035\, U_{wind} \qquad (1)$$

where: U_{oil} = oil drift vector
$\mathrm{U}_{current}$ = current vector (when ice concentration < 80%)
U_{wind} = wind speed at 10 m above the sea surface

The drift angle was computed as a function of wind speed according to the formula in Samuels et al. (1982). (The drift angle is inversely related to wind speed.)

$$U_{current} = U_{tidal} + U_{density}$$

where: U_{tidal} = tidal currents (2)
$U_{density}$ = density induced and net transport flows

The tidal currents, both residual (time averaged) and time varying, are simulated using a two-dimensional, vertically averaged simulation. The model is forced using the Schwiderski tidal constituents for 11 constituents (as shown in the table below). The model physics is based on Kowalik (1984) and Johnson and Kowalik (1986). The grid is a rectangular mesh and a 50^{o} angle to the east and north (fig. 6). Details of the resolution are shown in the summary table below.

Two sets of $\mathrm{U}_{density}$ currents are used, one set for Cook Inlet and a second for the Gulf of Alaska.

- For Cook Inlet, the $U_{density}$ currents are simulated using a three-dimensional hydrodynamic model run in the robust diagnostic mode. The model is based on Semtner (1974) and Chao (1987). Because the density data needed to force the model are scarce in their temporal and spatial distribution, only two seasonal diagnostic representations are possible. The grid is the same as in the tidal calculation (fig. 6) with up to nine 20-m-thick layers.

Schwiderski Tidal Constituencies	
M_2	principal lunar, semidiurnal
S_2	principal solar, semidiurnal
K_1	declination luni-solar, diurnal
O_1	principal lunar, diurnal
N_2	elliptical lunar, semidiurnal
P_1	principal solar, diurnal
K_2	declination luni-solar, semidiurnal
Q_1	elliptical lunar, diurnal
MF	fortnightly lunar, long period
MM	monthly lunar, long period
SSA	semiannual solar, long period

Summary of Spatial and Temporal Resolution Used to Describe the Environmental Input Data to the Oil-Spill Trajectory Model

Input Data to Trajectory Model	Spatial Resolution	Temporal Resolution/Total Record Length	Comment
U_{wind}	250° lat./ long. (approx.)	6 hours/9 years	Limited Fine Mesh atmospheric model predictions on a curvilinear grid
U_{tidal}	0.04° lat./ 0.04° long.	3-hour/29-day period (M_2 + K_1) 11 principal constituents	Generated by hydrodynamic model (3-D), robust diagnostic calculation
$U_{density}$	0.04° lat./ 0.04° long.	seasonal (summer/winter)	Generated by hydrodynamic model (3-D), robust diagnostic calculation
$U_{density}$	0.33° lat./ 0.50° long.	annual mean	Generated by hydrodynamic model (3-D), diagnostic calculation

- For the Gulf of Alaska, the $U_{density}$ currents are simulated using a three-dimensional hydrodynamic model run in the diagnostic mode. The density data for this model were derived from the Levitus annual climatology (Levitus, 1982). The model is based on the model of Semtner (1974) and on the dissertation work of Bang (1991). The grid spacing is 1/2° longitude and 1/3° latitude, and it has a maximum of 20 layers.

For each trajectory simulation, the start time for the first trajectory was the first day of the season (winter or summer) of the first year of wind data (1978) at 6 a.m. GMT (Greenwich Mean Time). Each subsequent trajectory was started every 1.0 days on average, at 6 a.m. GMT. A total of 3,240 trajectories (1,620 in winter, 1,620 in summer) was launched over the 9-year period of wind data (1978-1986). The current field was assembled with the use of the start time, to establish the tidal currents, the appropriate seasonal diagnostic density current, and the wind data to be used. Each simulation lasted for up to 30 days, and data from each flow field were matched in time and space to create a final U_{oil}.

The wind data set used was from the National Weather Service Limited Fine Mesh (LFM) model (Gerrity, 1977), and the 9-year simulation covered both the low frequency variability and interannual variability. The LFM winds were modified in the vicinity of Cook Inlet and Shelikof Strait following discussions with National Oceanic and Atmospheric Administration (NOAA) investigators (Stabeno, pers. commun., 1993). The NOAA projects in Shelikof Strait since 1978 have shown that the winds are significantly modified by the local topography (Muench and Schumacher, 1980). Recent low-level aircraft observations have suggested that the directions of the winds calculated from the large-scale pressure field should be corrected to account for these orographic effects (Lackmann and Overland, 1989; Macklin, Stabeno, and Schumacher, 1993). Their experience with the wind product produced by the METLIB system from the barometric pressure calculation revealed that the winds within Shelikof Strait and Lower Cook Inlet should be modified according to the table on the next page.

A major assumption used in this analysis is that the mean flows are quasi-steady and that they can be adequately represented by addition of the flow components. More specifically, this assumption implies that the nonlinear interactions are small and do not substantively contribute to the circulation. Field and theoretical studies are underway at present to quantify these effects, not only in the study area but also throughout the world's oceans (Westerink et al., 1989). Sensitivity tests and comparisons with data illustrate that the linear superposition captures the first-order transport and the dominant flow. After quality assurance checks were passed, the trajectories were used in the OSRA model structure. Each trajectory was plotted, and the OSRA model was run, given the land/sea segments and environmental resources specified for this analysis. Individual plots of trajectories and overlays of land/sea segments and environmental resources were examined to ensure that contacts were properly established and tabulated. A description of the adequacy and sensitivity of the trajectories to the oceanographic features is given in the Discussion section.

A total of 1,620 hypothetical oil-spill trajectories were simulated for the winter and summer (3,240 total) from each of the 991 hypothetical spill sites, which were evenly spread over 7 hypothetical launch areas to represent the platform risk (fig. 1).

Transportation risks were represented by 3,240 trajectories launched from each of the 100 points spaced uniformly along hypothetical transportation segments for pipelines (P1-P6) (fig. 2). Surface transport of the oil slick for each spill was simulated as a series of straight-line displacements in 1-hour increments of a point governed by the U_{oil} vectors discussed above.

Rotation and Change in Magnitude in the Upper and Lower Shelikof Strait Necessary to Obtain Appropriate Ageostrophic Winds (Winds are in the Oceanographic Convention)				
Geostrophic Winds	Upper Shelikof Strait		Lower Shelikof Strait	
Direction (T)	Direction	Magnitude	Direction	Magnitude
150° – 210°	No Change	No Change	No Change	No Change
210° – 270°	225°	1.1	225°	1.4
270° – 360°	T-45°	0.8	T-45°	0.0
0° – 30°	No Change	No Change	No Change	No Change
30° – 90°	45°	1.3	45°	1.1
90° - 150°	T-45°	0.9	T-45°	0.8
Source: P.J. Stabeno, pers. commun. with Walter Johnson, MMS, January 1993.				

As the simulated oil spill moved, any contacts with environmental resources were recorded. Spill movement continued until the spill contacted land, moved out of the study area, or aged more than 30 days.

The trajectories simulated by the model represent hypothetical pathways of oil slicks; they do not involve any direct consideration of cleanup, dispersion, or weathering processes that could determine the quantity or properties of the oil that might eventually contact the environmental resources or land segments. An implicit analysis of weathering and decay can be considered by noting the age of simulated trajectories when they contact environmental resources. For this analysis, three periods were selected—3, 10, and 30 days—to represent implicit measures of oil weathering as well as matters relating to containment and cleanup.

Conditional Probabilities of Contact

The probability that an oil spill will contact a specific environmental resource within a given time of travel from a certain location or spill point is termed a *conditional probability*, the condition being that a spill is assumed to have occurred. Each trajectory was allowed to continue for as long as 30 days. However, if the hypothetical spill contacted shoreline sooner than 30 days after the start of the spill, the spill trajectory was terminated, and the contact was recorded.

The trajectories simulated by the model represent only hypothetical pathways of oil slicks; they do not involve any direct consideration of cleanup, dispersion, or weathering processes that could alter the quantity or properties of oil that might eventually contact the environmental resource locations. However, an implicit analysis of weathering and decay can be considered by noting the ages of the simulated oil spills when they contact environmental resource locations. Conditional probabilities of contact with environmental resource locations and land segments within 30 days of travel time were calculated for each of the hypothetical spill sites by the model to serve as input into the final calculation of risk (tables 2-10 and appendices B and C).

Combined Probabilities of Contact

A critical difference exists between the conditional probabilities and the *combined probabilities* calculated. Conditional probabilities depend only on the winds, ice, and currents in the study area. Combined probabilities, on the other hand, depend not only on the physical conditions, but also on the chance of spill occurrence, the estimated volume of oil to be produced or transported, and the oil transportation scenario. The combined probabilities for this analysis of the proposed action activities are presented in tables 11-19.

In calculating the combined probabilities, those that represent probabilities of both oil-spill occurrence and contact, the following steps are performed:

1. For a set of n_t environmental resources and n_l launch points, the conditional probabilities can be represented in a matrix form. Let [C] be an $n_t \times n_l$ matrix, where each element $c_{i,j}$ is the probability that an oil spill will contact environmental resource *i*, given that a spill occurs at launch point *j*. Note that launch points can represent potential starting points of spills from production areas or transportation routes.

2. Spill occurrence can be represented by another matrix [S]. With n_l launch points and n_s production sites, the dimensions of [S] are $n_l \times n_s$. Let each element $s_{j,k}$ be the estimated mean number of spills occurring at launch point *j* owing to production of a unit volume (1 Bbbl) of oil at site *k*. These spills can result from either production or transportation. The $s_{j,k}$ can be determined as a function of the volume of oil (spills/Bbbl). Each column of [S] corresponds to one production site and one transportation route. If alternative and mutually exclusive transportation routes are considered for the same production site, they can be represented by additional columns of [S], thus increasing n_s.

3. Matrix [U] is defined as

$$[U] = [C] \times [S]$$

   Matrix [U]—which has dimensions $n_t \times n_s$—is termed the unit risk matrix. Each element $u_{i,k}$ corresponds to the estimated mean number of spills occurring and contacting environmental resource *i*, owing to the production of a unit volume (1 Bbbl) of oil at site *k*.

4. With [U], the mean contacts to each environmental resource are estimated, given a set of oil volumes at each site. Let [V] be a vector of dimension n_s where each element v_k corresponds to the volume of oil expected to be found at production site *k*. Then, if [L] is a vector of dimension n_t, where each element $?_i$ corresponds to the mean number of contacts to environmental resource *i*, the formula is

$$[L] = [U] \times [V]$$

Thus, estimates of the mean number of oil spills that will occur and contact environmental resources (or land segments) can be calculated. (Note that as a statistical parameter, the mean number can assume a fractional value, even though fractions of oil spills have no physical meaning.)

Discussion

Trajectory Simulations: The quality assurance checks (performed by MMS) provide an important means of gaining information and insight into the behavior of the simulated trajectories. The annual conditional probabilities of contact (tables 2 through 10) and the seasonal conditional probabilities (appendices B and C) yield much oceanographic information. Some summary information, which may lend confidence to the analyst, is provided below to help identify the statistical behavior of the trajectories.

The wind-induced surface drift is the dominant component of U_{oil} except where the density-induced or tidal circulation is very strong. In addition, the wind-driven flow component contains seasonal trends as well as a large degree of variability. Some information can be gained by comparing winter versus summer probabilities (when wind speeds are high versus low).

The second dominant transport factor is the density-induced flow. This forcing results in well-organized, coherent flows that follow the general trend of the coastline and the Shelikof Strait. The degree to which wind forcing plays a role in Shelikof Strait has been studied as part of the NOAA Fisheries Oceanographic Cooperative Investigations study (Muench and Schumacher, 1980), and there is often a reinforcement of the wind-driven component by the density-driven component.

Tides were included in the analysis because Cook Inlet has large tidal amplitudes, and there were indications from the past MMS-contracted models that tidal currents are important. The OSRA time step of 1 hour does not introduce significant aliasing or loss of amplitude of the tidal currents. Tests indicate that a longer time step would have caused some reduction of the maximum currents and variance associated with the tides. The tidal currents cause trajectories to exhibit displacements primarily up and down Cook Inlet. The tidal displacements have an estimated maximum of about 5 to 7 km within the 1-hour time interval. Because the tidal currents are cyclical, the effect is to add a "sawtooth" pattern to the density-driven and wind-drift current components. The tidal model currents had small residual mean values (less than 1 cm/sec) at all grid points.

Some drifting buoy observations in Cook Inlet and Shelikof Strait exist, but comparing drifter tracts with modeled trajectories and statistical summaries must be done carefully. The studies of Muench and Schumacher (1980) show many drifter tracks exiting Shelikof Strait to the southwest. These tracks indicate variations of the currents in the region called the "sea valley." In general, the results of the three-dimensional hydrodynamic model show these features at the correct location and magnitude. The simulated trajectories appear far more variable than these drifter tracks due to wind influences. The drifters used by Muench and Schumacher (1980) were drogued at 10 m and would not feel the effect of the wind or uppermost surface layer. The modeled U_{oil} transport vector has, to a large degree, components of wind-driven and surface-driven motion. Thus, the observations and simulations contain similar trends, but an exact match should not be expected.

In conclusion, the simulated spill trajectories for Cook Inlet OCS Lease Sales 191 and 199 show distinct variations in response to seasonal wind patterns and the strength of density-driven currents. Hypothetical spills on the shelf show the wind-induced variability and the relatively important density-driven current in Cook Inlet and Shelikof Strait. Landfall, or contact, of the trajectories is highest for points located on the western coast of lower Cook Inlet and the western coast of Shelikof Strait.

Estimated Probabilities: The base case of the proposed action, which assumes 0.14 Bbbl of oil, has an estimated mean of 0.02 platform spills and 0.19 transportation (via pipeline) spills, respectively, for a total of 0.21 spills greater than or equal to 1,000 bbl (table 1). There is an estimated 19-percent probability that one or more spills greater than or equal to 1,000 bbl may occur as a result of this action. The deferrals do not reduce the estimated probability significantly.

In general, only environmental resources located near the hypothetical spill site have high probabilities of being contacted by spills originating at that location. This is logical because each trajectory simulation stops when land is contacted, and the simulations show relatively early contacts to land. The land segments with the highest chance of contact from all launch areas are generally along the western shorelines of lower Cook Inlet in Kamishak Bay and Shelikof Strait. Contacts to western shorelines are greater in magnitude and the length of coastline contacted is longer for launch areas located on the western side of Cook Inlet. Launch areas in southern Cook Inlet tend to produce patterns of contact that show trajectories overall move more southward in the Inlet. For a particular launch area, contacts to the south are further away and higher in probability than contacts in the north, reflecting the predominant coastal flow in the inlet and strait. Pipelines have balanced east and west probability of contact.

For pipeline segments (P1-P6—fig. 2), there is an estimated 30- to 64-percent annual average conditional probability (expressed as percent chance) that a spill originating from these segments will contact land within 3 days (table 2). Within a 10-day period, these probabilities increase to 86- to 97-percent probabilities of contact to land (table 3). There is an estimated probability of 99-percent or greater that a spill originating from one of these segments will contact land within 30 days (table 4).

Tables 5 through 7 illustrate the conditional probabilities of contacting specific land segments (fig. 5) within a 3-, 10-, and 30-day period, respectively. In general, each land segment is at greatest risk of being contacted from spills originating slightly to its northeast. Land segments with an estimated probability of contact of less than 0.5 percent from spills originating at any of the hypothetical spill sites are not listed. Land segments 24 through 35 have higher conditional probabilities, between 1- and 22-percent. Other land segments have conditional probabilities less than or equal to 10 percent within 30 days (table 7). Tables 8 through 10 show that the boundary segments (fig. A-5), which are sufficiently far from the lease areas and pipeline segments, have less than a 0.5-percent conditional probability of contact.

Tables 11 through 19 present the combined probabilities. These results consider the estimated probability that a spill greater than or equal to 1,000 bbl will occur and contact an environmental resource or land segment as a result of the production or transportation scenario. There is an estimated 10-percent probability that a spill greater than 1,000 bbl will occur and contact land within 3 days as a result of the proposed action. This probability of contact increases to 18 percent within 10 days, and 19 percent within 30 days. The deferral alternatives do not significantly change the combined probabilities.

The maximum estimated combined probability of a spill occurring and contacting any specific land segment does not exceed 2 percent within a 30-day period (table 16). Likewise, the maximum estimated combined probability of a spill occurring and contacting any specific land segment as a result of any deferral does not exceed 2 percent within a 30-day period (table 16).

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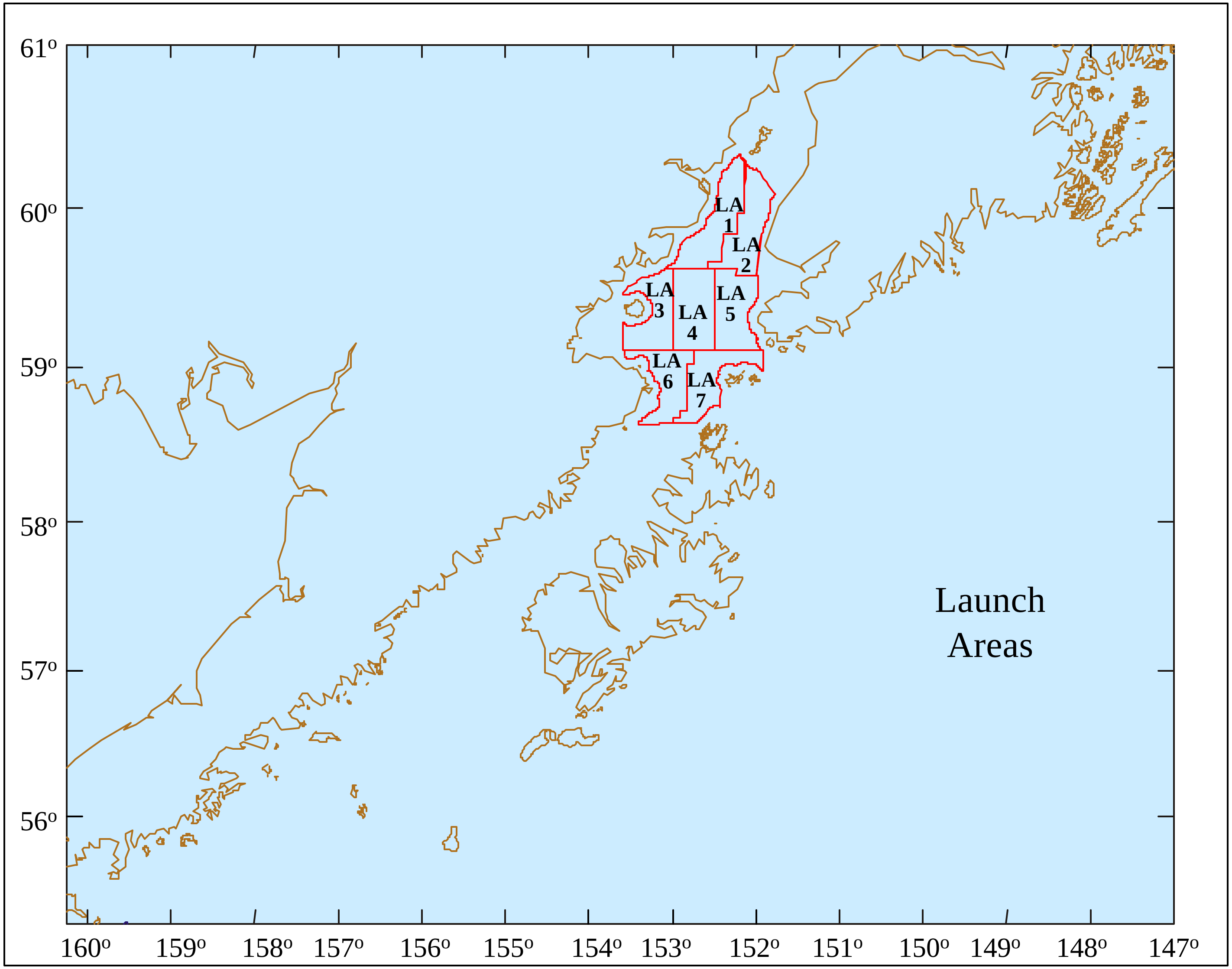

Figure 1. The OSRA Study Area and Hypothetical Launch Areas (LA1-LA7), Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

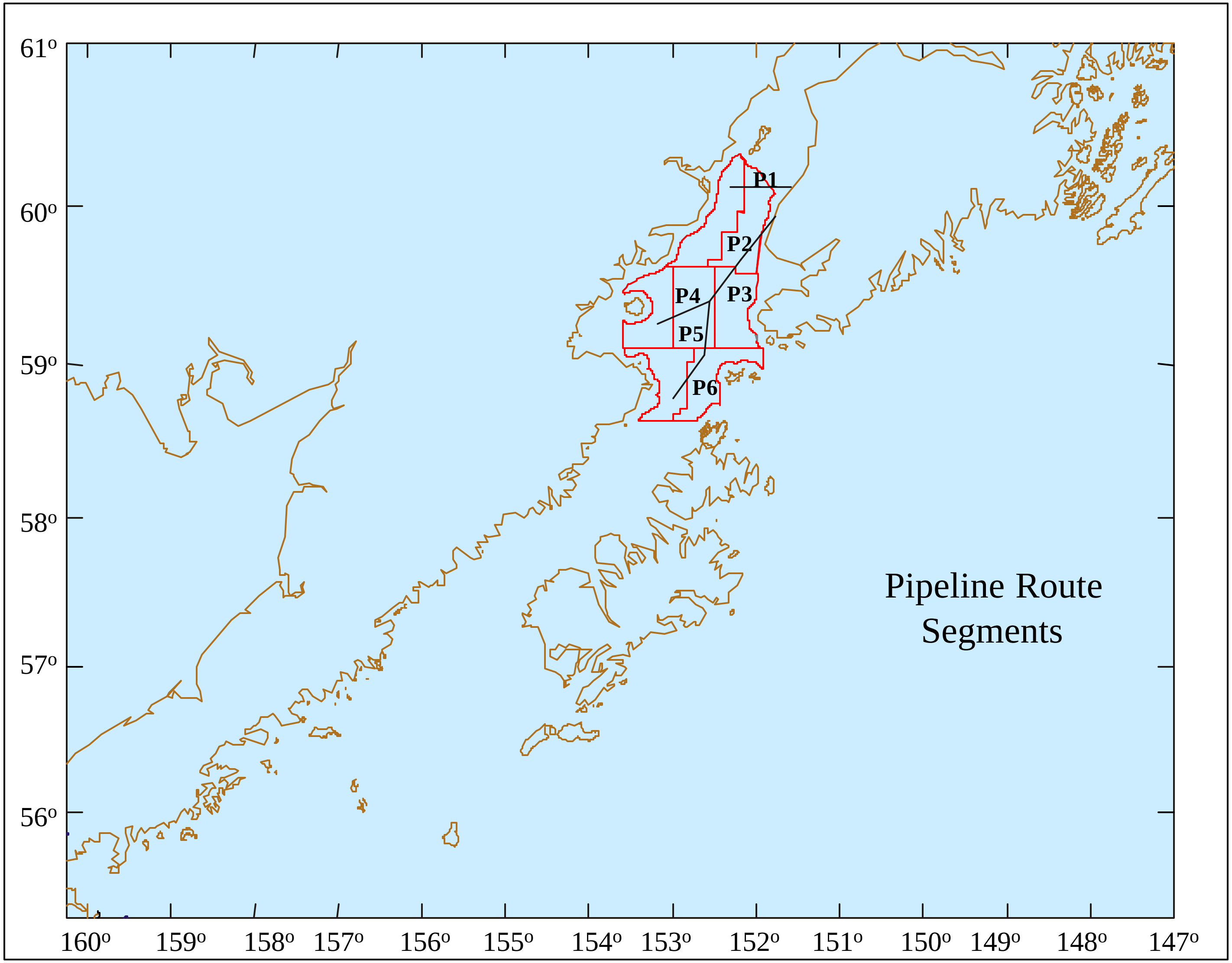

Figure 2. Locations of Hypothetical Pipeline Route Segments (P1-P6), Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

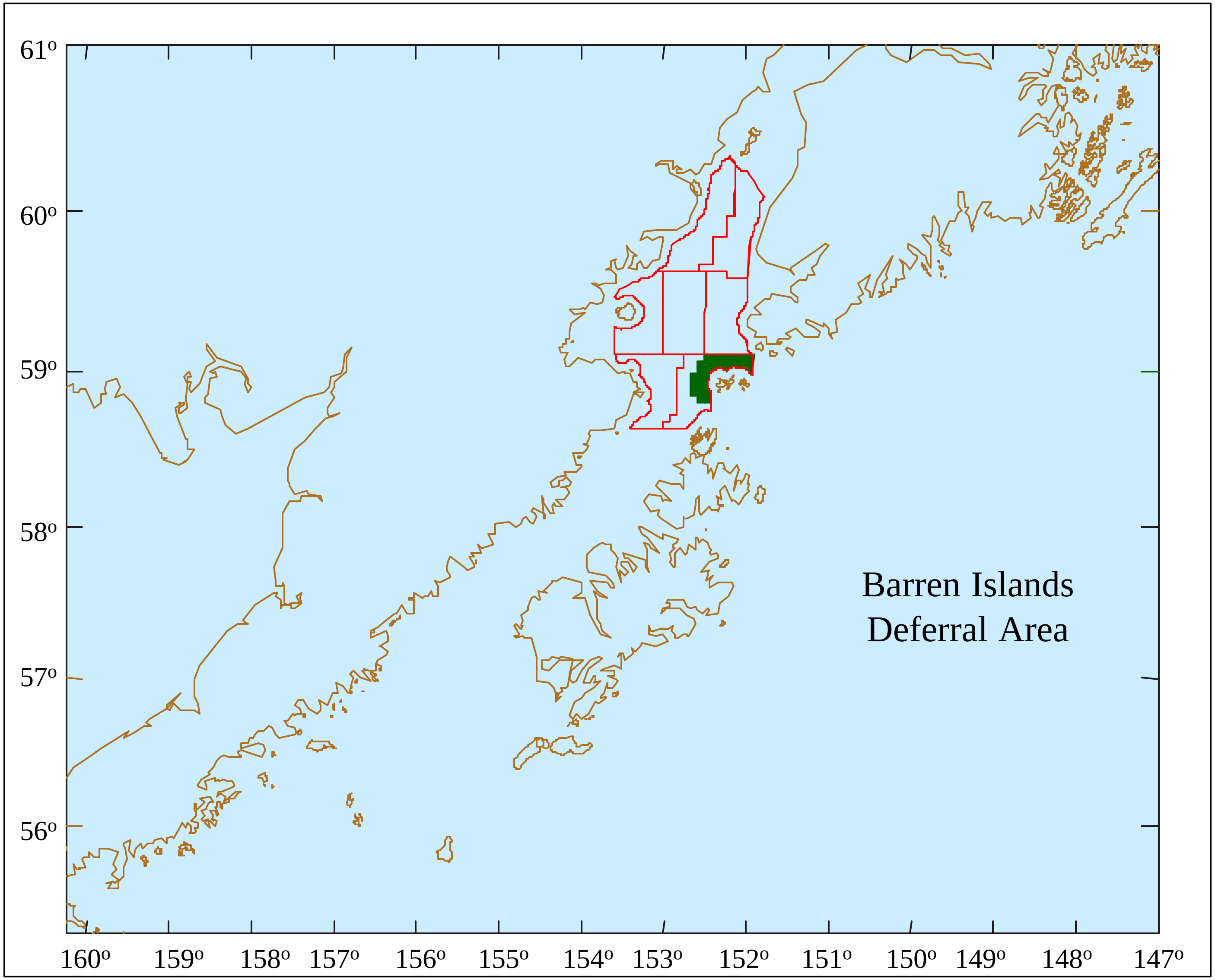

Figure 3. Location of Barren Islands Deferral Area, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

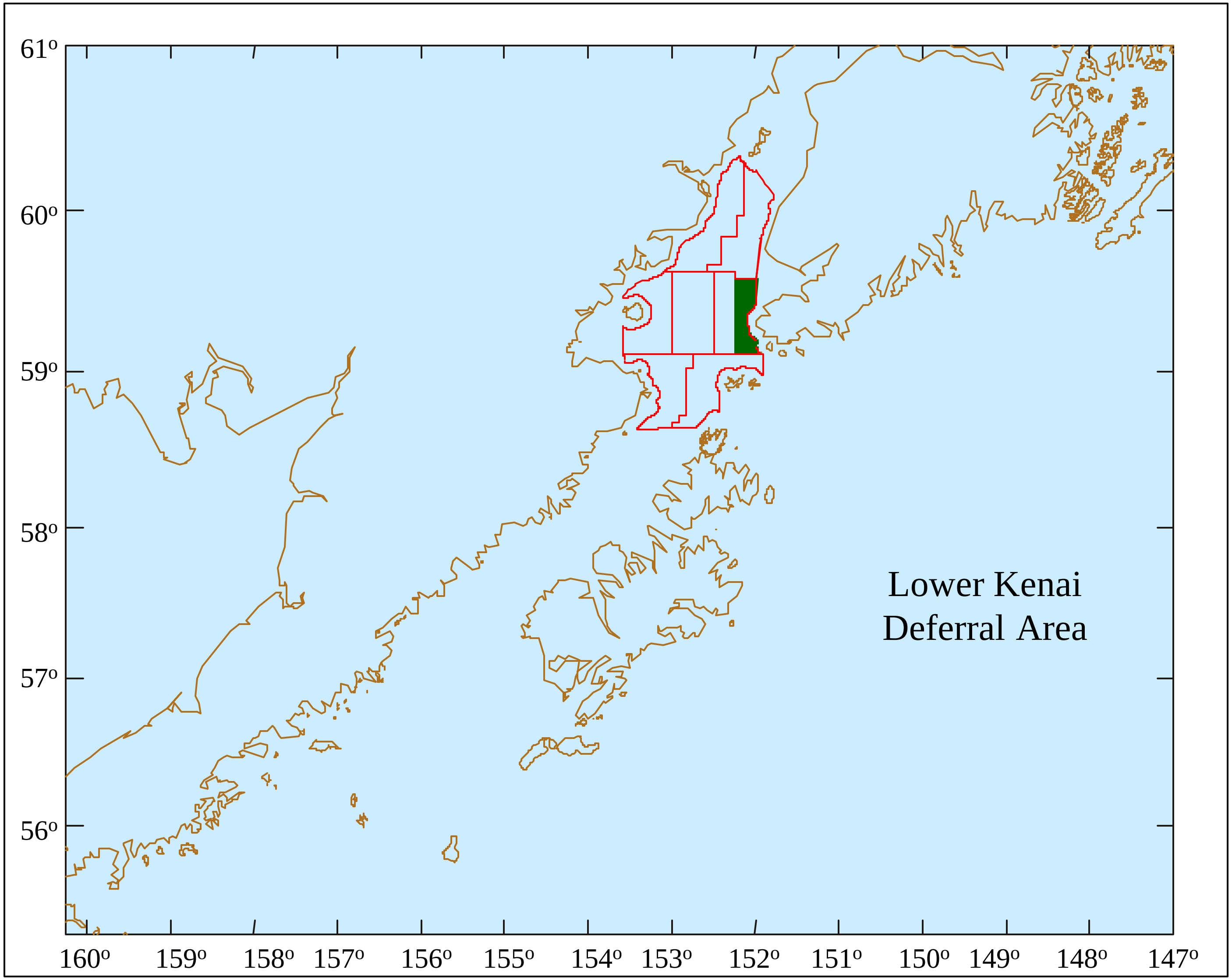

Figure 4. Location of Lower Kenai Deferral Area, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

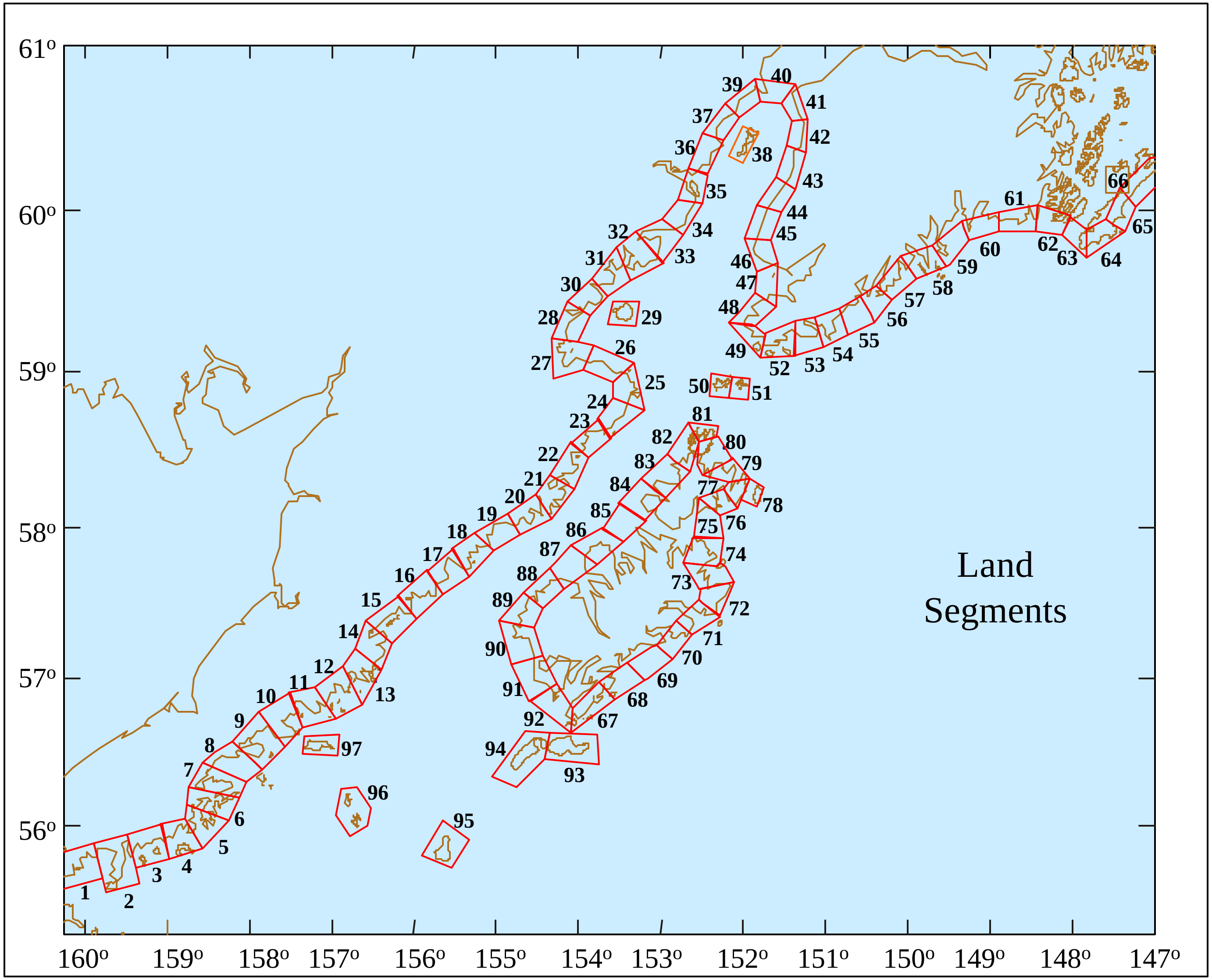

Figure 5. Study Area Coastline Divided into 97 Land Segments, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

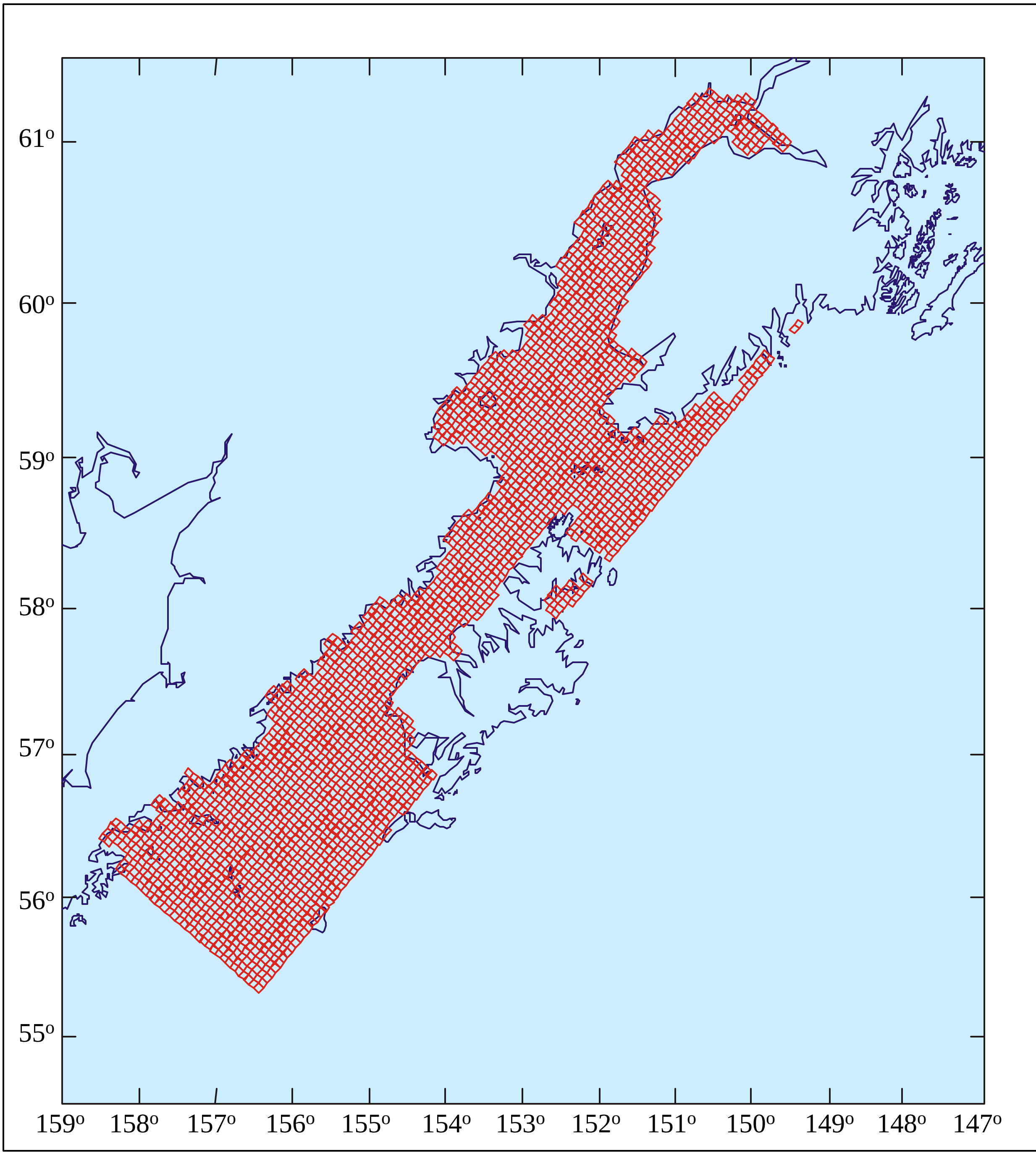

Figure 6. Rectangular Grid Used in Model Simulation of Tidal Currents, OCS Lease Sales 191 and 199

Table 1. Oil-spill occurrence probability estimates for spills greater than or equal to 1,000 barrels resulting over the assumed production life of the proposed action and alternative actions, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.*

Source	Volume of Oil (Bbbl)	Mean Number of Spills	Probability of One or More Spills
Proposed Action	0.140		
Platforms		0.02	2%
Pipelines		0.19	17%
All Sources		0.21	19%
Barren Islands Deferral	0.126		
Platforms		0.02	2%
Pipelines		0.17	16%
All Sources		0.19	17%
Lower Kenai Deferral	0.126		
Platforms		0.02	2%
Pipelines		0.17	16%
All Sources		0.19	17%

* The probability estimates were calculated for OCS Lease Sale 191 and can be used to represent estimates for Sale 199.

Table 2. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	65	49	64	41	29	55	38	64	48	30	42	32	43
Tuxedni Bay	50	30	.	.	1	.	.	65	11	2	.	.	.
Chinitna Bay	16	9	.	1	1	.	.	6	8	2	.	.	.
Outer Kachemak Bay	3	18	.	4	39	.	2	1	29	19	3	5	.
Outer Kamishak Bay	13	13	78	45	24	10	3	2	13	33	64	28	2
Inner Kamishak Bay	2	3	37	16	8	6	1	.	2	11	29	11	1
Barren Islands	.	.	1	2	14	3	42	.	.	1	1	5	9
Cape Douglas	1	.	10	15	12	56	28	.	.	4	11	26	44
Shuyak Island	.	.	1	1	1	5	11	.	.	.	1	2	7
Hallo/Kukak Bays	.	.	1	1	1	16	12	.	.	.	1	2	17
Kupreanof Strait	.	.	.	.	.	2	2	.	.	.	.	1	2
Katmai Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
Puale Bay	.	.	.	.	.	1	1	.	.	.	.	.	.
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Kalgin	8	10	.	.	.	.	.	27	1	.	.	.	.
S. Shelikof Strait	.	.	.	.	.	.	1	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	1	2	.	2	18	.	2	.	2	5	1	2	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 3. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	95	93	93	89	86	91	86	97	93	88	89	86	88
Tuxedni Bay	51	34	.	2	3	.	.	69	15	6	1	1	.
Chinitna Bay	18	13	1	2	3	.	.	8	13	5	1	1	.
Outer Kachemak Bay	5	20	2	7	41	1	4	3	31	22	6	9	1
Outer Kamishak Bay	19	24	80	54	40	11	8	7	27	49	71	38	4
Inner Kamishak Bay	5	8	41	23	18	7	4	2	8	21	37	19	2
Barren Islands	1	1	2	4	15	5	44	.	1	2	3	7	13
Cape Douglas	3	4	16	24	23	63	40	2	4	11	20	39	56
Shuyak Island	1	1	3	4	3	9	15	.	1	2	4	5	12
Hallo/Kukak Bays	1	1	3	5	6	24	22	.	1	3	5	10	28
Kupreanof Strait	.	.	1	2	2	5	5	.	.	1	2	3	6
Katmai Bay	.	.	1	1	1	6	6	.	.	1	1	2	6
Puale Bay	.	.	1	2	2	6	8	.	.	1	2	3	7
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	1	.	.	.	.	.	1
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	9	13	.	1	1	.	.	29	4	2	.	1	.
S. Shelikof Strait	.	.	1	2	2	6	8	.	.	1	2	3	7
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	3	1	3	20	.	4	.	3	7	3	4	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 4. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	**	**	**	**	**	99	99	**	**	**	**	**	99
Tuxedni Bay	51	34	1	2	4	.	1	69	15	6	2	2	.
Chinitna Bay	19	13	1	3	4	.	1	9	13	6	2	2	.
Outer Kachemak Bay	5	20	2	7	42	1	5	3	31	23	7	9	2
Outer Kamishak Bay	20	25	80	55	41	11	8	8	28	51	72	40	4
Inner Kamishak Bay	6	8	41	24	19	8	4	3	9	22	38	20	2
Barren Islands	1	1	2	4	16	5	44	.	1	3	4	8	13
Cape Douglas	3	5	17	26	25	64	42	2	4	13	22	41	57
Shuyak Island	1	1	4	4	3	9	15	.	1	2	4	6	12
Hallo/Kukak Bays	1	1	4	7	7	25	24	1	1	3	6	11	30
Kupreanof Strait	1	1	2	3	2	6	6	.	1	2	2	4	6
Katmai Bay	1	1	1	2	2	7	8	.	.	1	2	3	7
Puale Bay	1	1	1	2	2	7	9	.	1	1	2	4	8
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	1	1	.	.	.	.	.	1
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	1	1	.	.	.	.	.	1
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	1	.	.	.	.	.	1
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	1	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	10	13	.	1	2	.	.	29	4	3	1	1	.
S. Shelikof Strait	1	1	1	3	3	7	9	.	1	1	2	4	8
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	3	1	4	20	1	4	1	3	7	3	4	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 5. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	.	.	.	3	3	.	.	.	.	.	4
22	Devils Cove, Hallo Bay	.	.	.	.	.	5	3	.	.	.	.	1	5
23	Cape Chiniak, Swikshak Bay	.	.	.	.	.	4	3	.	.	.	.	.	4
24	Fourpeaked Glacier	.	.	1	2	2	15	8	.	.	.	1	4	14
25	Spotted Glacier, Sukoi Bay	.	.	5	8	6	14	5	.	.	2	6	12	6
26	Douglas River	.	.	12	6	3	4	.	.	.	3	11	5	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	.	.	9	3	1	1	.	.	.	1	6	1	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	.	.	6	2	.	.	.	.	.	1	4	1	.
29	Augustine Island	3	3	14	9	3	.	.	.	4	7	9	3	.
30	Rocky Cove, Tignagvik Point	3	2	7	2	.	.	.	.	1	1	1	.	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	2	1	6	3	1	.	.	.	1	2	1	.	.
32	Chinitna Point, Dry Bay	7	3	3	3	1	.	.	1	4	3	1	.	.
33	Chinitna Bay	15	8	.	1	1	.	.	5	8	2	.	.	.
34	Iliamna Point	13	8	.	.	.	.	.	15	4	1	.	.	.
35	Chisik Island, Tuxedni Bay	12	6	.	.	.	.	.	18	1	.	.	.	.
36	Redoubt Point	5	3	.	.	.	.	.	6	.	.	.	.	.
38	Kalgin Island	1	1	.	.	.	.	.	3	.	.	.	.	.
43	Clam Gulch, Kasilof	.	1	.	.	.	.	.	2	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	.	1	.	.	.	.	.	9	.	.	.	.	.
45	Cape Starichkof, Happy Valley	1	5	.	.	.	.	.	5	15	1	.	.	.
46	Anchor Point, Anchor River	.	3	.	.	2	.	.	.	6	2	.	.	.
47	Seldovia	.	1	.	.	2	.	.	.	2	2	.	.	.
48	Nanwalek, Port Graham	.	1	.	.	3	.	.	.	1	2	.	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1						
50	Barren Islands, Ushagat Island	.	.	.	.	1	1	5	.	.	.	.	1	2
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	1						
81	Shuyak Island	.	.	.	.	.	1	2	.	.	.	.	.	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	1	.	.	3	3	.	.	.	1	1	3
83	Foul Bay, Paramanof Bay	.	.	.	.	.	1	1	.	.	.	.	.	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 6. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
13	Cape Providence, Chiginagak Bay													
14	Agripina Bay, Ashiiak Island, Cape Kilokak	.	.	.	.	.	.	1	.	.	.	.	.	1
15	Cape Kayakliut, Wide Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
16	Cape Kanatak, Cape Unalishagvak, Portage Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
17	Cape Aklek, Puale Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	.	.	1	2	.	.	.	.	1	1
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	.	.	2	2	.	.	.	.	1	2
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	1	1	2	7	7	.	.	1	1	3	9
22	Devils Cove, Hallo Bay	.	.	1	2	2	9	8	.	.	1	2	4	10
23	Cape Chiniak, Swikshak Bay	.	.	1	1	1	7	6	.	.	1	1	2	7
24	Fourpeaked Glacier	.	1	2	4	4	18	12	.	.	2	4	8	18
25	Spotted Glacier, Sukoi Bay	1	2	8	11	11	16	8	1	2	5	9	17	9
26	Douglas River	2	2	15	9	8	5	1	1	2	8	15	8	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	2	12	7	6	1	1	.	3	7	12	5	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	2	8	5	4	1	1	.	2	5	8	4	.
29	Augustine Island	5	7	16	13	9	1	1	2	9	13	13	7	1
30	Rocky Cove, Tignagvik Point	5	5	9	5	3	.	.	2	6	5	3	2	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	4	4	7	5	4	.	.	1	5	6	2	2	.
32	Chinitna Point, Dry Bay	9	7	5	6	4	.	.	2	7	7	3	2	.
33	Chinitna Bay	18	13	1	2	3	.	.	8	13	5	1	1	.
34	Iliamna Point	15	11	.	1	2	.	.	18	7	3	1	1	.
35	Chisik Island, Tuxedni Bay	14	9	.	.	.	.	.	22	3	1	.	.	.
36	Redoubt Point	6	5	.	.	.	.	.	9	2	.	.	.	.
37	Drift River, Drift River Terminal								1	.	.	.	.	
38	Kalgin Island								6	1	1	.	.	.
42	Kalifornsky, Kasilof River, Kenai River	2	3	.	.	.	.	.	1	.	.	.	.	.
43	Clam Gulch, Kasilof	1	1	.	.	.	.	.	3	1	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	2	.	.	.	.	.	10	1	.	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	.	1	.	.	6	16	2	.	.	.
46	Anchor Point, Anchor River	1	3	.	1	3	.	.	1	7	3	1	1	.
47	Seldovia	1	2	.	1	4	.	1	.	3	4	1	1	.
48	Nanwalek, Port Graham	1	1	.	1	4	.	1	.	1	3	1	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1	.	.	.	.	1	.
50	Barren Islands, Ushagat Island	.	.	1	1	2	2	6	.	.	1	1	2	4
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2	.	.	.	.	.	1
81	Shuyak Island	.	.	1	1	1	2	4	.	.	.	1	2	3
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	2	2	1	6	6	.	.	1	2	3	6
83	Foul Bay, Paramanof Bay	.	.	1	1	1	3	3	.	.	1	1	1	3
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	1	1	1	1	.	.	.	.	1	1
85	Kupreanof Strait, Viekoda Bay	.	.	.	.	.	1	1	.	.	.	.	1	1
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	.	1	.	2	1	.	.	.	1	1	2
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	.	.	1	1	.	.	.	.	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	.	.	.	.	.	1	.	.	.	.	.	.	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table 7. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
13	Cape Providence, Chiginagak Bay	.	.	.	.	.	.	1						
14	Agripina Bay, Ashiiak Island, Cape Kilokak	.	.	.	.	.	1	1	.	.	.	.	.	1
15	Cape Kayakliut, Wide Bay	.	.	.	.	.	1	2	.	.	.	.	1	1
16	Cape Kanatak, Cape Unalishagvak, Portage Bay	.	.	.	1	.	1	2	.	.	.	.	1	1
17	Cape Aklek, Puale Bay	.	.	.	.	.	1	1	.	.	.	.	1	1
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	1	1	2	2	.	.	.	.	1	2
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	.	1	2	2	.	.	.	.	1	2
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	1	1	2	2	.	.	.	.	1	2
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	1	2	2	7	7	.	1	1	2	3	10
22	Devils Cove, Hallo Bay	.	1	1	2	2	9	9	.	.	1	2	4	11
23	Cape Chiniak, Swikshak Bay	.	.	1	2	2	8	7	.	.	1	2	3	8
24	Fourpeaked Glacier	1	1	3	5	5	19	13	.	1	2	4	9	19
25	Spotted Glacier, Sukoi Bay	1	2	8	12	11	16	8	1	2	6	10	17	9
26	Douglas River	2	3	15	10	8	5	2	1	3	8	16	9	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	2	12	7	6	1	1	1	3	8	12	6	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	2	8	6	4	1	1	1	2	5	8	5	.
29	Augustine Island	6	8	17	14	10	1	2	2	9	14	14	8	1
30	Rocky Cove, Tignagvik Point	5	5	9	5	4	.	1	2	6	5	4	3	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	4	5	7	5	4	.	1	1	5	7	3	2	.
32	Chinitna Point, Dry Bay	9	7	5	6	5	.	1	2	8	8	4	3	.
33	Chinitna Bay	18	13	1	3	4	.	1	8	13	6	2	2	.
34	Iliamna Point	15	12	.	1	2	.	.	18	8	3	1	1	.
35	Chisik Island, Tuxedni Bay	14	10	.	.	1	.	.	22	3	1	.	.	.
36	Redoubt Point	6	5	.	.	.	.	.	9	2	1	.	.	.
37	Drift River, Drift River Terminal								1	.	.	.	.	.
38	Kalgin Island	2	3	.	.	1	.	.	6	1	1	.	.	.
42	Kalifornsky, Kasilof River, Kenai River								1	.	.	.	.	.
43	Clam Gulch, Kasilof	1	2	.	.	.	.	.	3	1	1	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	2	.	.	.	.	.	10	1	.	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	1	1	.	.	6	16	2	.	1	.
46	Anchor Point, Anchor River	1	3	.	1	3	.	.	1	7	4	1	1	.
47	Seldovia	1	2	.	1	4	.	1	.	3	4	1	2	.
48	Nanwalek, Port Graham	1	1	.	1	4	.	1	.	1	3	1	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1	.	.	.	.	1	.
50	Barren Islands, Ushagat Island	.	.	1	1	2	2	7	.	.	1	1	3	4
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2	.	.	.	.	.	1
81	Shuyak Island	.	.	1	1	1	2	4	.	.	1	1	2	3
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	1	2	2	2	6	6	.	1	1	2	3	6
83	Foul Bay, Paramanof Bay	.	.	1	1	1	3	3	.	.	1	1	1	3
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	1	1	1	1	.	.	.	1	1	2
85	Kupreanof Strait, Viekoda Bay	.	.	.	1	1	1	1	.	.	.	1	1	1
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	1	1	1	2	1	.	.	.	1	1	2
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	1	.	1	1	.	.	.	1	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	.	.	.	.	.	1	1	.	.	.	.	.	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table 8. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table 9. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table 10. Annual conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table 11. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain environmental resource area over the assumed production life of the lease area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Environmental Resource Area	**Prob**	**Mean**	**Prob**	**Mean**	**Prob**	**Mean**
Land	10	.	10	.	10	.
Tuxedni Bay	5	.	5	.	5	.
Chinitna Bay	1	.	1	.	1	.
Outer Kachemak Bay	4	.	4	.	4	.
Outer Kamishak Bay	3	.	3	.	3	.
Inner Kamishak Bay	1	.	1	.	1	.
Barren Islands	.	.	.	.	.	.
Cape Douglas	.	.	.	.	.	.
Shuyak Island	.	.	.	.	.	.
Hallo/Kukak Bays	.	.	.	.	.	.
Kupreanof Strait	.	.	.	.	.	.
Katmai Bay	.	.	.	.	.	.
Puale Bay	.	.	.	.	.	.
Middle Cape	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.
Forelands	.	.	.	.	.	.
S. Kalgin	2	.	2	.	2	.
S. Shelikof Strait	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	.	.	.	.	.	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 12. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain environmental resource area over the assumed production life of the lease area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Environmental Resource Area	**Prob**	**Mean**	**Prob**	**Mean**	**Prob**	**Mean**
Land	18	.	18	.	18	.
Tuxedni Bay	6	.	6	.	6	.
Chinitna Bay	2	.	2	.	2	.
Outer Kachemak Bay	4	.	4	.	4	.
Outer Kamishak Bay	5	.	5	.	5	.
Inner Kamishak Bay	2	.	2	.	2	.
Barren Islands	.	.	.	.	.	.
Cape Douglas	1	.	1	.	1	.
Shuyak Island	.	.	.	.	.	.
Hallo/Kukak Bays	.	.	.	.	.	.
Kupreanof Strait	.	.	.	.	.	.
Katmai Bay	.	.	.	.	.	.
Puale Bay	.	.	.	.	.	.
Middle Cape	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.
Forelands	.	.	.	.	.	.
S. Kalgin	2	.	2	.	2	.
S. Shelikof Strait	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	1	.	1	.	1	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 13. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain environmental resource area over the assumed production life of the lease area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Environmental Resource Area	**Prob**	**Mean**	**Prob**	**Mean**	**Prob**	**Mean**
Land	19	.	19	.	19	.
Tuxedni Bay	6	.	6	.	6	.
Chinitna Bay	2	.	2	.	2	.
Outer Kachemak Bay	4	.	4	.	4	.
Outer Kamishak Bay	5	.	5	.	5	.
Inner Kamishak Bay	2	.	2	.	2	.
Barren Islands	.	.	.	.	.	.
Cape Douglas	1	.	1	.	1	.
Shuyak Island	.	.	.	.	.	.
Hallo/Kukak Bays	.	.	.	.	.	.
Kupreanof Strait	.	.	.	.	.	.
Katmai Bay	.	.	.	.	.	.
Puale Bay	.	.	.	.	.	.
Middle Cape	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.
Forelands	.	.	.	.	.	.
S. Kalgin	2	.	2	.	2	.
S. Shelikof Strait	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	1	.	1	.	1	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table 14. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain land segment over the assumed production life of the lease area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
		Prob	Mean	Prob	Mean	Prob	Mean
25	Spotted Glacier, Sukoi Bay	.	.	.	.	.	.
26	Douglas River	.	.	.	.	.	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	.	.	.	.	.	.
29	Augustine Island	1	.	1	.	1	.
30	Rocky Cove, Tignagvik Point	.	.	.	.	.	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	.	.	.	.	.	.
32	Chinitna Point, Dry Bay	1	.	1	.	1	.
33	Chinitna Bay	1	.	1	.	1	.
34	Iliamna Point	1	.	1	.	1	.
35	Chisik Island, Tuxedni Bay	1	.	1	.	1	.
36	Redoubt Point	.	.	.	.	.	.
38	Kalgin Island	.	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	.	1	.	1	.
45	Cape Starichkof, Happy Valley	2	.	2	.	2	.
46	Anchor Point, Anchor River	1	.	1	.	1	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown.

Table 15. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain land segment over the assumed production life of the lease area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
		Prob	Mean	Prob	Mean	Prob	Mean
25	Spotted Glacier, Sukoi Bay	.	.	.	.	.	.
26	Douglas River	1	.	1	.	1	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	.	1	.	1	.
29	Augustine Island	1	.	1	.	1	.
30	Rocky Cove, Tignagvik Point	1	.	1	.	1	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	1	.	1	.	1	.
32	Chinitna Point, Dry Bay	1	.	1	.	1	.
33	Chinitna Bay	2	.	2	.	2	.
34	Iliamna Point	2	.	2	.	2	.
35	Chisik Island, Tuxedni Bay	2	.	2	.	2	.
36	Redoubt Point	1	.	1	.	1	.
38	Kalgin Island	.	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	.	1	.	1	.
45	Cape Starichkof, Happy Valley	2	.	2	.	2	.
46	Anchor Point, Anchor River	1	.	1	.	1	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown

Table 16. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain land segment over the assumed production life of the lease area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
		Prob	Mean	Prob	Mean	Prob	Mean
25	Spotted Glacier, Sukoi Bay	1	.	1	.	1	.
26	Douglas River	1	.	1	.	1	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	.	1	.	1	.
29	Augustine Island	2	.	2	.	2	.
30	Rocky Cove, Tignagvik Point	1	.	1	.	1	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	1	.	1	.	1	.
32	Chinitna Point, Dry Bay	1	.	1	.	1	.
33	Chinitna Bay	2	.	2	.	2	.
34	Iliamna Point	2	.	2	.	2	.
35	Chisik Island, Tuxedni Bay	2	.	2	.	2	.
36	Redoubt Point	1	.	1	.	1	.
38	Kalgin Island	1	.	1	.	1	.
44	Deep Creek, Ninilchik, Ninilchik River	1	.	1	.	1	.
45	Cape Starichkof, Happy Valley	2	.	2	.	2	.
46	Anchor Point, Anchor River	1	.	1	.	1	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown

Table 17. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain boundary segment over the assumed production life of the lease area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Boundary Segment	Prob	Mean	Prob	Mean	Prob	Mean

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown

Table 18. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain boundary segment over the assumed production life of the lease area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Boundary Segment	Prob	Mean	Prob	Mean	Prob	Mean

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown

Table 19. Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain boundary segment over the assumed production life of the lease area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

	Proposed Action		Lower Kenai Deferral		Barren Islands Deferral	
Boundary Segment	Prob	Mean	Prob	Mean	Prob	Mean

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows will all values less than 0.5 percent are not shown

Appendix A

Locations of Environmental Resource Areas

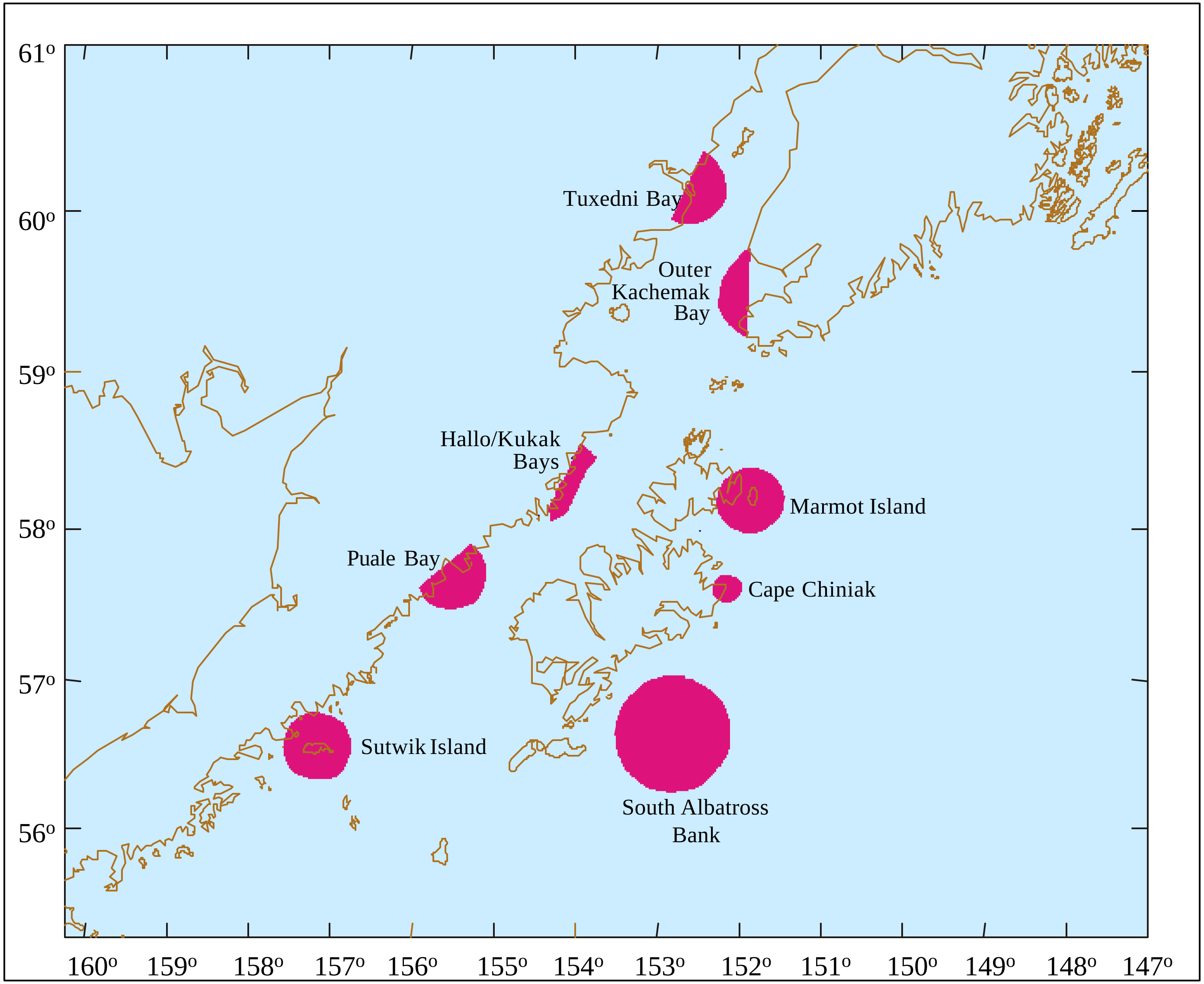

Figure A-1. Locations of Tuxedni Bay, Outer Kachemak Bay, Hallo/Kukak Bays, Marmot Island, Puale Bay, Cape Chiniak, Sutwik Island, and South Albatross Bank, Cook Inlet Planning Area, OCS Lease Sales 191 and 199. (Shading indicates aerial extent.)

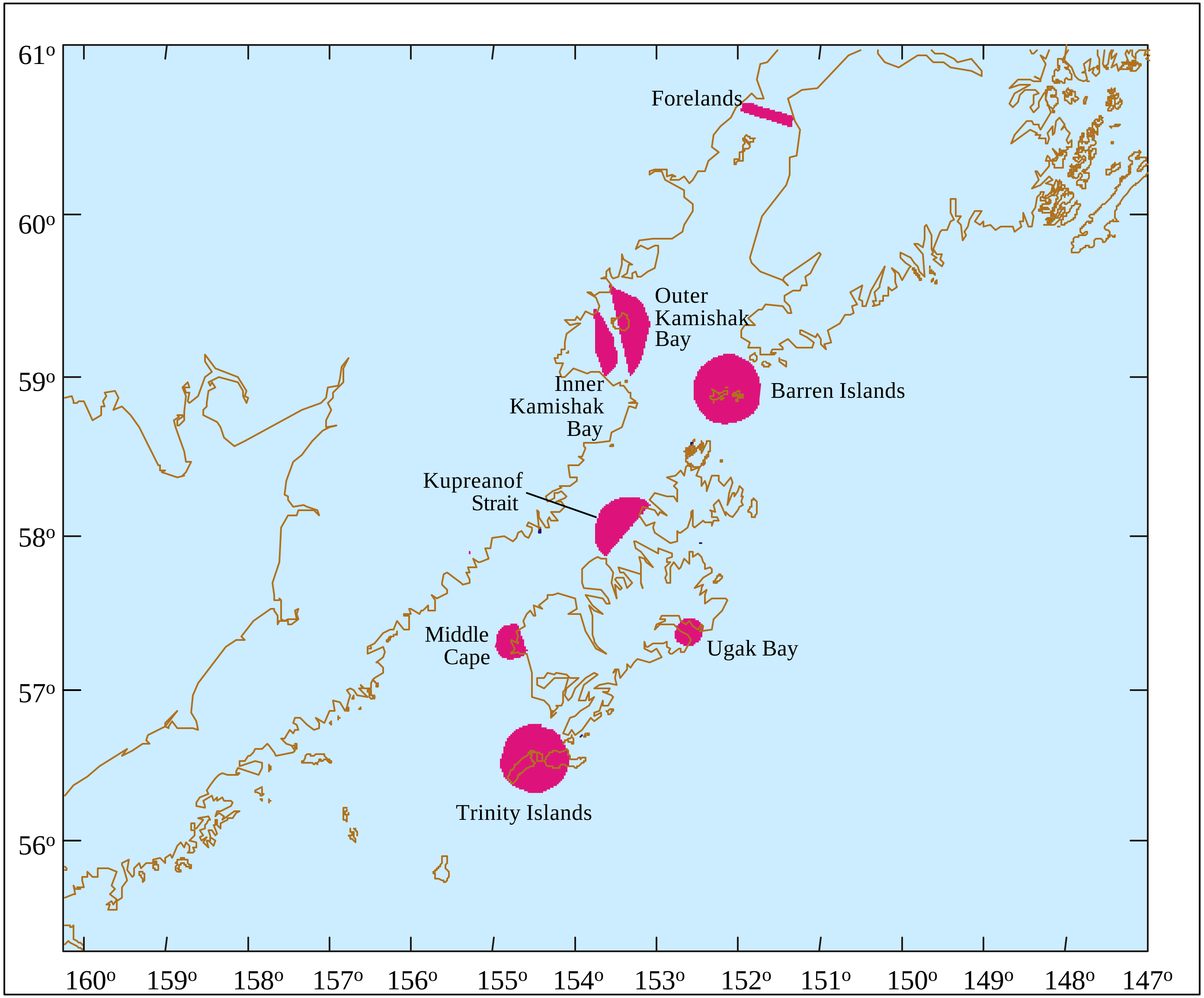

Figure A-2. Locations of Forelands, Outer Kamishak Bay, Inner Kamishak Bay, Barren Islands, Kupreanof Strait, Middle Cape, Ugak Bay, and Trinity Islands, Cook Inlet Planning Area, OCS Lease Sales 191 and 199. (Shading indicates aerial extent.)

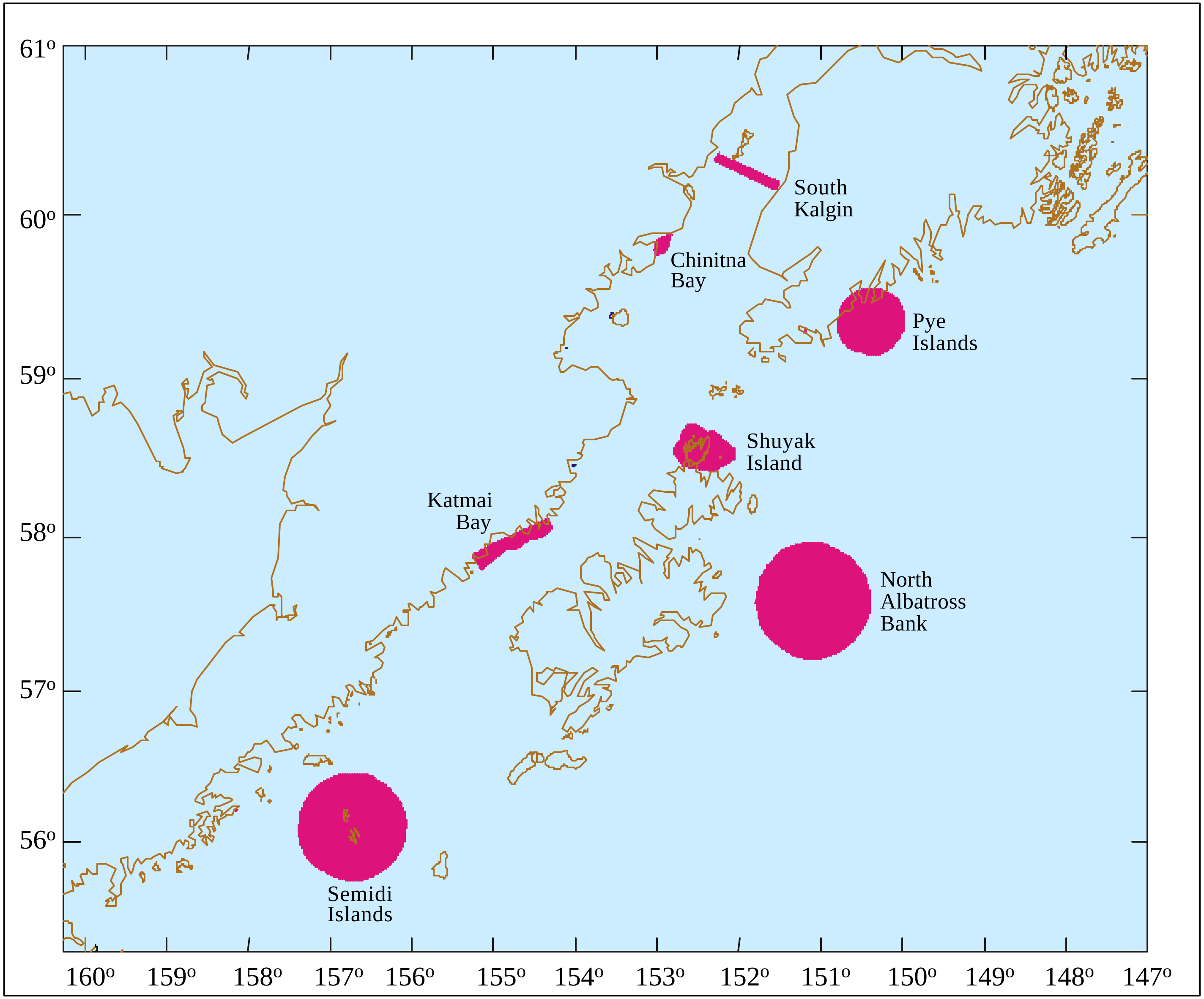

Figure A-3. Locations of South Kalgin, Chinitna Bay, Pye Islands, Shuyak Island, Katmai Bay, North Albatross Bank, and Semidi Islands, Cook Inlet Planning Area, OCS Lease Sales 191 and 199. (Shading indicates aerial extent.)

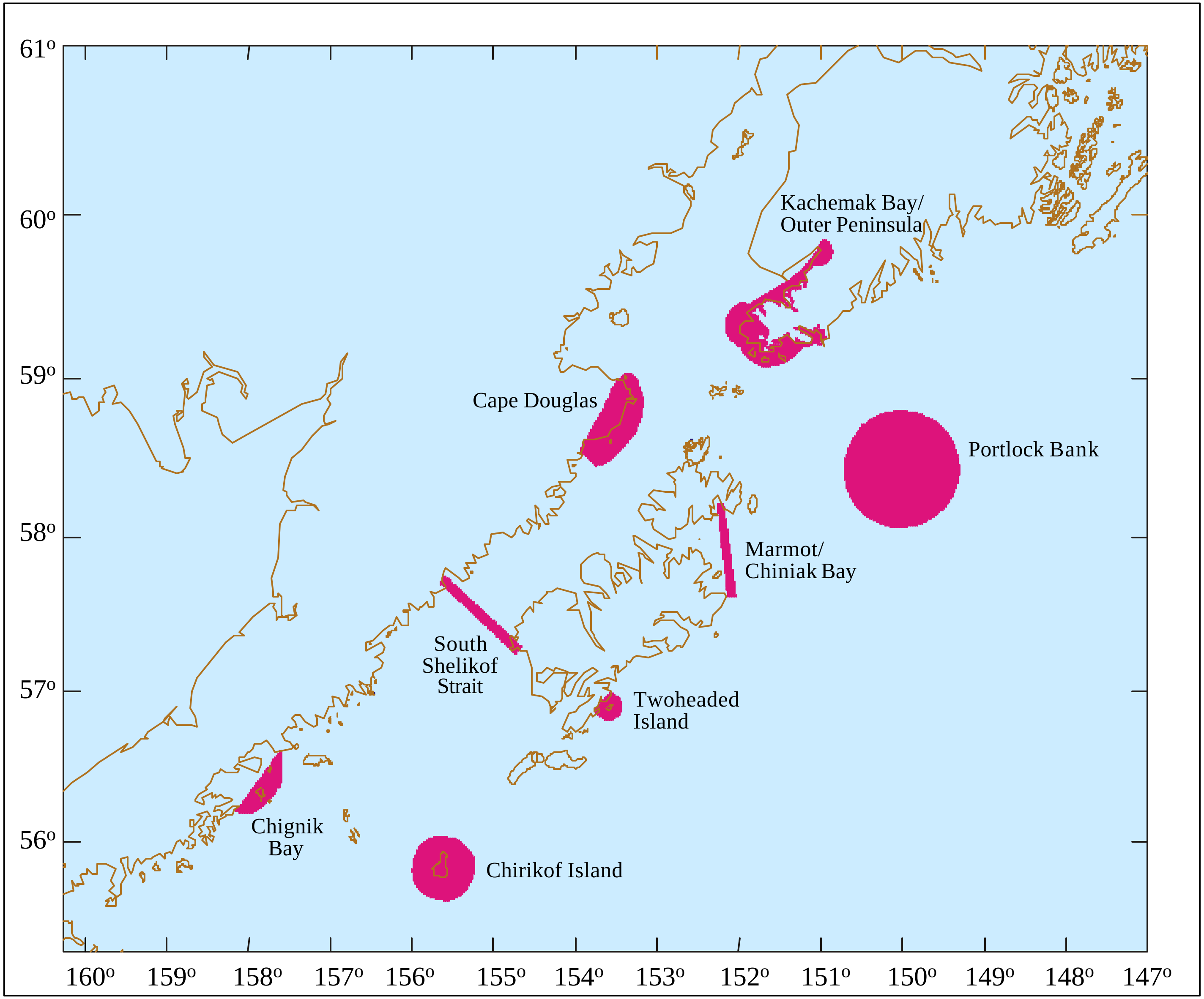

Figure A-4. Locations of Kachemak Bay/Outer Peninsula, Cape Douglas, Marmot/Chiniak Bay, Portlock Bank, South Shelikof Strait, Twoheaded Island, Chignik Bay, and Chirikof Island, Cook Inlet Planning Area, OCS Lease Sales 191 and 199. (Shading indicates aerial extent.)

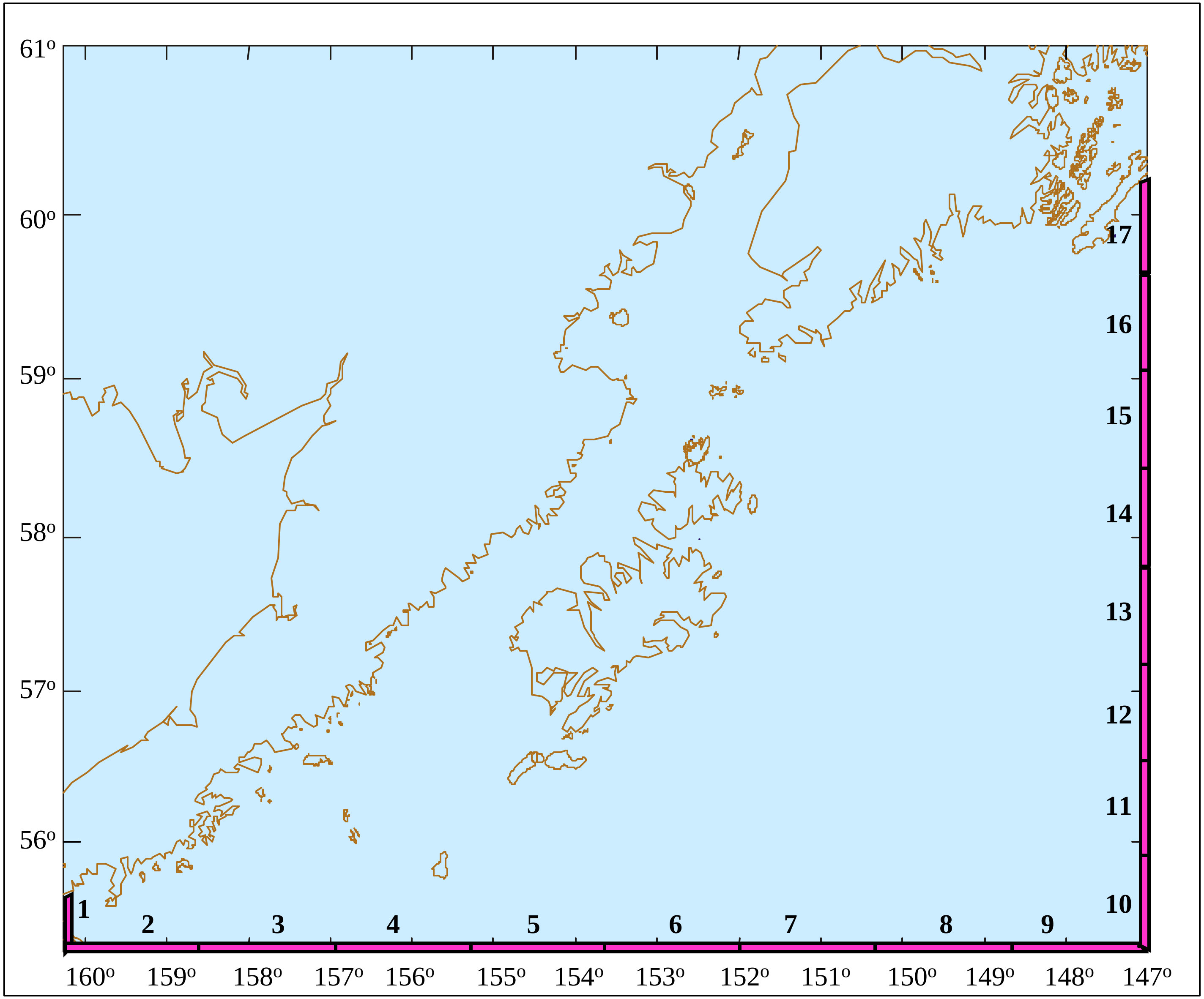

Figure A-5. Locations of 17 Boundary Segments, Cook Inlet Planning Area, OCS Lease Sales 191 and 199. (Shading indicates aerial extent.)

Appendix B

Summer Conditional Probabilities

Table B-1. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	59	41	52	29	19	45	28	60	40	19	28	19	32
Tuxedni Bay	51	34	.	.	1	.	.	64	14	2	.	.	.
Chinitna Bay	15	7	.	1	.	.	.	2	7	2	.	.	.
Outer Kachemak Bay	2	18	.	4	42	.	3	1	33	21	3	6	.
Outer Kamishak Bay	6	5	78	42	18	12	3	.	5	24	62	28	2
Inner Kamishak Bay	1	1	33	12	4	7	1	.	1	6	24	9	.
Barren Islands	.	.	.	1	14	3	46	.	.	.	1	4	11
Cape Douglas	.	.	7	7	6	52	23	.	.	.	3	16	39
Shuyak Island	.	.	.	.	.	5	11	.	.	.	.	1	7
Hallo/Kukak Bays	.	.	.	.	.	10	5	.	.	.	.	.	9
Kupreanof Strait	.	.	.	.	.	1	.	.	.	.	.	.	.
Katmai Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Puale Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Kalgin	10	14	.	.	.	.	.	35	2	.	.	.	.
S. Shelikof Strait	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	.	1	.	2	20	.	3	.	1	4	2	3	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table B-2. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	93	91	89	83	80	86	79	96	90	83	83	79	82
Tuxedni Bay	53	41	1	3	4	.	.	70	20	8	2	2	.
Chinitna Bay	18	12	1	3	3	.	.	6	13	6	2	1	.
Outer Kachemak Bay	5	21	2	8	45	1	5	2	35	25	7	11	2
Outer Kamishak Bay	14	17	81	56	41	13	9	3	20	46	75	44	4
Inner Kamishak Bay	3	5	39	23	17	8	4	1	6	18	37	21	2
Barren Islands	1	.	2	4	16	7	49	.	.	2	3	8	17
Cape Douglas	1	1	14	18	17	62	40	.	1	6	14	33	55
Shuyak Island	.	.	3	3	2	11	17	.	.	1	3	6	14
Hallo/Kukak Bays	.	.	2	3	3	21	19	.	.	1	2	7	24
Kupreanof Strait	.	.	1	1	1	4	3	.	.	.	1	2	4
Katmai Bay	.	.	.	1	.	5	5	.	.	.	.	1	5
Puale Bay	.	.	.	.	.	3	4	.	.	.	.	1	3
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	1	.	.	.	.	.	1
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	1	1	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	13	18	.	1	2	.	.	38	6	3	1	1	.
S. Shelikof Strait	.	.	.	.	.	3	4	.	.	.	.	1	3
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	2	1	4	23	1	5	1	3	7	4	5	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table B-3. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	**	**	**	**	99	**	99	**	**	**	**	**	99
Tuxedni Bay	53	41	1	4	5	.	1	70	21	9	3	3	1
Chinitna Bay	19	13	1	4	4	.	1	6	14	7	2	2	.
Outer Kachemak Bay	5	21	3	9	46	2	6	2	35	26	9	12	3
Outer Kamishak Bay	15	18	81	58	44	14	11	3	21	49	75	45	5
Inner Kamishak Bay	4	6	40	24	19	8	5	1	7	20	38	22	2
Barren Islands	1	1	3	4	16	8	50	.	1	3	4	8	17
Cape Douglas	2	2	16	20	20	63	42	1	2	8	17	36	57
Shuyak Island	1	1	4	4	3	12	17	.	.	2	4	7	14
Hallo/Kukak Bays	1	1	4	5	5	23	22	.	1	2	4	9	26
Kupreanof Strait	.	.	1	2	1	5	4	.	.	1	2	2	5
Katmai Bay	.	.	1	2	2	7	7	.	.	1	1	3	8
Puale Bay	.	.	1	1	1	5	6	.	.	.	1	2	6
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	1	.	.	.	.	.	1
Marmot Island	.	.	.	.	.	.	1	.	.	.	.	.	1
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	1	1	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	14	19	1	2	3	.	.	39	7	4	2	2	.
S. Shelikof Strait	.	.	.	1	1	4	5	.	.	.	.	2	5
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	3	2	4	23	1	5	1	3	8	4	6	2

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table B-4. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	.	.	.	2	1	.	.	.	.	.	2
22	Devils Cove, Hallo Bay	.	.	.	.	.	3	1	.	.	.	.	.	2
23	Cape Chiniak, Swikshak Bay	.	.	.	.	.	3	2	.	.	.	.	.	2
24	Fourpeaked Glacier	.	.	.	.	.	13	6	.	.	.	.	1	12
25	Spotted Glacier, Sukoi Bay	.	.	3	4	3	15	5	.	.	.	1	9	7
26	Douglas River	.	.	8	3	1	4	.	.	.	1	6	3	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	.	.	6	1	.	1	.	.	.	.	4	.	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	.	.	4	1	.	.	.	.	.	.	3	.	.
29	Augustine Island	1	1	13	8	3	.	.	.	1	5	10	3	.
30	Rocky Cove, Tignagvik Point	1	.	5	2	.	.	.	.	.	1	1	.	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	2	1	7	3	.	.	.	.	1	2	1	.	.
32	Chinitna Point, Dry Bay	6	2	4	4	1	.	.	.	2	2	1	.	.
33	Chinitna Bay	13	6	.	1	.	.	.	2	6	1	.	.	.
34	Iliamna Point	12	7	.	.	.	.	.	11	4	1	.	.	.
35	Chisik Island, Tuxedni Bay	13	7	.	.	.	.	.	19	1	.	.	.	.
36	Redoubt Point	6	3	.	.	.	.	.	7	.	.	.	.	.
38	Kalgin Island	1	2	.	.	.	.	.	4	.	.	.	.	.
43	Clam Gulch, Kasilof	.	1	.	.	.	.	.	2	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	.	1	.	.	.	.	.	10	.	.	.	.	.
45	Cape Starichkof, Happy Valley	1	5	.	.	.	.	.	4	17	1	.	.	.
46	Anchor Point, Anchor River	.	3	.	.	2	.	.	.	7	2	.	.	.
47	Seldovia	.	1	.	.	3	.	.	.	2	2	.	.	.
48	Nanwalek, Port Graham	.	.	.	.	3	.	.	.	.	1	.	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1	.					
50	Barren Islands, Ushagat Island	.	.	.	.	.	1	5	.	.	.	.	1	2
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	1	.					
81	Shuyak Island	.	.	.	.	.	1	2	.	.	.	.	.	1
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	.	.	.	2	2	.	.	.	.	.	2
83	Foul Bay, Paramanof Bay	.	.	.	.	.	1	1	.	.	.	.	.	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table B-5. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	.	.	1	1	.	.	.	.	.	1
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	1	1	1	5	5	.	.	.	.	1	7
22	Devils Cove, Hallo Bay	.	.	1	1	1	7	7	.	.	.	1	2	9
23	Cape Chiniak, Swikshak Bay	.	.	1	1	1	8	6	.	.	.	1	2	7
24	Fourpeaked Glacier	.	.	2	3	3	18	12	.	.	1	3	6	18
25	Spotted Glacier, Sukoi Bay	.	.	7	8	8	17	10	.	1	3	6	15	11
26	Douglas River	.	1	12	8	6	4	2	.	1	5	11	8	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	1	10	6	5	2	1	.	2	6	11	6	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	8	5	4	1	1	.	1	4	8	5	.
29	Augustine Island	4	5	17	15	10	1	2	1	6	13	17	9	1
30	Rocky Cove, Tignagvik Point	3	3	8	5	3	.	.	1	4	5	4	3	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	5	4	9	7	5	.	.	1	5	8	4	2	.
32	Chinitna Point, Dry Bay	10	6	7	8	5	.	1	1	8	9	5	3	.
33	Chinitna Bay	18	12	1	3	3	.	.	5	13	6	1	1	.
34	Iliamna Point	15	12	.	1	2	.	.	15	9	4	1	1	.
35	Chisik Island, Tuxedni Bay	16	12	.	.	1	.	.	26	4	1	.	.	.
36	Redoubt Point	8	7	.	.	.	.	.	12	2	1	.	.	.
37	Drift River, Drift River Terminal	1	1	.	.	.	.	.	1	.	.	.	.	.
38	Kalgin Island	3	5	.	.	.	.	.	8	1	1	.	.	.
39	Seal River, Big River	.	.	.	.	.	.	.	1	.	.	.	.	.
42	Kalifornsky, Kasilof River, Kenai River	.	.	.	.	.	.	.	1	.	.	.	.	.
43	Clam Gulch, Kasilof	1	2	.	.	.	.	.	5	1	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	3	.	.	.	.	.	12	1	.	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	.	1	.	.	5	18	2	.	.	.
46	Anchor Point, Anchor River	1	4	.	1	4	.	.	1	8	4	1	1	.
47	Seldovia	1	2	.	1	5	.	1	.	3	4	1	2	.
48	Nanwalek, Port Graham	1	1	.	1	4	.	1	.	1	3	1	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	1	3	.	2	.	.	.	1	1	.
50	Barren Islands, Ushagat Island	.	.	1	1	1	2	7	.	.	1	1	2	5
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2	.	.	.	.	.	1
80	Andreon & Perenosa Bay, Big Fort Island	.	.	.	.	.	.	1						
81	Shuyak Island	.	.	1	1	1	3	4	.	.	.	1	1	3
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	2	2	1	6	6	.	.	1	2	2	6
83	Foul Bay, Paramanof Bay	.	.	.	1	.	3	3	.	.	.	.	1	3
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	.	.	1	1	.	.	.	.	.	1
85	Kupreanof Strait, Viekoda Bay	.	.	.	.	.	1	.	.	.	.	.	.	.
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	.	.	.	1	.	.	.	.	.	.	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	.	.	1	.						

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table B-6. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
13	Cape Providence, Chiginagak Bay													
14	Agripina Bay, Ashiiak Island, Cape Kilokak	.	.	.	.	.	1	1	.	.	.	.	.	1
15	Cape Kayakliut, Wide Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
16	Cape Kanatak, Cape Unalishagvak, Portage Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
17	Cape Aklek, Puale Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	.	.	1	2	.	.	.	.	1	1
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	.	.	2	2	.	.	.	.	1	2
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	1	1	2	2	.	.	.	.	1	3
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	1	1	1	6	6	.	.	1	1	2	8
22	Devils Cove, Hallo Bay	.	.	1	2	2	8	8	.	.	1	2	3	10
23	Cape Chiniak, Swikshak Bay	.	.	2	2	2	8	7	.	.	1	2	3	8
24	Fourpeaked Glacier	.	.	2	4	4	18	13	.	.	2	4	7	19
25	Spotted Glacier, Sukoi Bay	1	1	7	9	9	17	10	.	1	3	7	16	11
26	Douglas River	1	1	12	8	7	5	2	.	1	6	12	8	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	2	11	7	6	2	1	.	2	7	12	6	1
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	8	6	4	1	1	.	2	5	9	5	1
29	Augustine Island	4	6	17	16	12	2	2	1	7	15	18	10	1
30	Rocky Cove, Tignagvik Point	4	4	8	5	4	.	1	1	4	6	4	3	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	5	5	10	7	6	.	1	1	6	9	4	3	.
32	Chinitna Point, Dry Bay	10	7	8	9	6	.	1	2	9	10	6	4	.
33	Chinitna Bay	19	13	1	4	4	.	1	6	14	7	2	2	.
34	Iliamna Point	15	13	1	2	3	.	1	15	9	4	1	1	.
35	Chisik Island, Tuxedni Bay	16	12	.	1	1	.	.	27	4	2	.	.	.
36	Redoubt Point	9	7	.	.	1	.	.	13	3	1	.	.	.
37	Drift River, Drift River Terminal	1	1	.	.	.	.	.	1	.	.	.	.	.
38	Kalgin Island	3	5	.	1	1	.	.	9	2	1	.	1	.
39	Seal River, Big River								1	.	.	.	.	.
42	Kalifornsky, Kasilof River, Kenai River								1	.	.	.	.	.
43	Clam Gulch, Kasilof	1	2	.	1	1	.	.	5	1	1	1	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	3	.	.	.	.	.	12	1	1	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	1	1	.	.	5	18	2	.	1	.
46	Anchor Point, Anchor River	1	4	.	1	4	.	1	1	8	4	1	2	.
47	Seldovia	1	3	1	2	6	.	1	.	3	4	1	2	1
48	Nanwalek, Port Graham	1	1	1	1	4	.	1	.	1	3	1	2	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	1	3	.	2	.	.	.	1	1	1
50	Barren Islands, Ushagat Island	.	.	1	1	2	3	8	.	.	1	1	3	5
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2	.	.	.			1
79	Seal Bay, Tonki Bay	.	.	.	.	.	.	1	.	.	.	.	.	1
80	Andreon & Perenosa Bay, Big Fort Island	.	.	.	.	.	.	1	.	.	.	.	.	1
81	Shuyak Island	.	.	1	1	1	3	5	.	.	.	1	2	4
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	2	2	2	6	6	.	.	1	2	3	7
83	Foul Bay, Paramanof Bay	.	.	.	1	1	3	3	.	.	.	1	1	4
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	.	.	1	1	.	.	.	.	1	1
85	Kupreanof Strait, Viekoda Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	.	.	.	1	1	.	.	.	.	.	1
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	.	.	1	.	.	.	.	.	.	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table B-7. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table B-8. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table B-9. Summer conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Appendix C

Winter Conditional Probabilities

Table C-1. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	71	57	75	53	39	65	48	68	56	41	56	45	53
Tuxedni Bay	49	25	.	.	.	.	.	66	8	1	.	.	.
Chinitna Bay	17	11	.	.	1	.	.	9	10	3	.	.	.
Outer Kachemak Bay	3	18	.	4	36	.	2	2	25	17	3	5	.
Outer Kamishak Bay	19	21	78	48	30	7	4	4	21	42	65	29	2
Inner Kamishak Bay	4	4	41	20	12	6	1	.	4	16	34	13	1
Barren Islands	.	.	1	2	14	2	38	.	.	1	2	5	7
Cape Douglas	1	1	13	23	19	60	33	.	1	7	19	37	50
Shuyak Island	.	.	2	2	1	5	11	.	.	1	2	2	7
Hallo/Kukak Bays	.	.	1	2	1	22	19	.	.	.	2	4	25
Kupreanof Strait	.	.	1	1	.	4	3	.	.	.	1	1	4
Katmai Bay	.	.	.	.	.	2	2	.	.	.	.	.	1
Puale Bay	.	.	.	.	.	1	2	.	.	.	.	.	1
Middle Cape	.	.	.	.	.	.	.	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Kalgin	5	7	.	.	.	.	.	18	1	.	.	.	.
S. Shelikof Strait	.	.	.	.	.	1	1	.	.	.	.	.	.
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	1	3	.	1	16	.	2	1	3	6	1	2	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table C-2. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	97	96	97	95	93	96	93	97	96	94	95	93	94
Tuxedni Bay	49	27	.	1	2	.	.	67	10	4	1	1	.
Chinitna Bay	18	13	.	1	3	.	.	11	12	5	1	1	.
Outer Kachemak Bay	5	20	1	6	37	.	3	4	26	20	4	7	1
Outer Kamishak Bay	25	31	79	52	39	8	6	12	35	52	68	33	3
Inner Kamishak Bay	7	11	43	24	19	7	3	4	11	24	38	17	2
Barren Islands	1	1	2	4	15	3	39	1	1	2	3	7	8
Cape Douglas	5	7	18	31	30	64	41	3	6	17	27	45	56
Shuyak Island	1	1	4	4	3	7	13	1	1	2	4	5	10
Hallo/Kukak Bays	2	2	4	8	8	27	26	1	2	4	7	13	32
Kupreanof Strait	1	1	2	4	3	6	7	.	1	2	3	5	8
Katmai Bay	1	1	1	2	2	6	8	.	.	1	2	3	7
Puale Bay	1	1	2	3	3	8	12	.	1	2	3	5	10
Middle Cape	.	.	.	.	.	1	1	.	.	.	.	.	.
Sutwik Island	.	.	.	.	.	1	1	.	.	.	.	.	1
Chignik Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Semidi Islands	.	.	.	.	.	1	1	.	.	.	.	.	1
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	6	7	.	.	1	.	.	19	2	1	.	.	.
S. Shelikof Strait	1	1	2	4	3	9	12	.	1	2	4	5	10
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	4	.	3	17	.	3	1	4	7	2	3	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table C-3. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource area within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Environmental Resource Area	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
Land	**	**	**	**	**	99	99	**	**	**	**	99	99
Tuxedni Bay	49	27	.	1	2	.	.	67	10	4	1	1	.
Chinitna Bay	18	13	.	1	3	.	.	11	12	5	1	1	.
Outer Kachemak Bay	5	20	1	6	37	.	3	4	26	20	4	7	1
Outer Kamishak Bay	26	32	79	53	39	8	6	12	35	53	69	34	4
Inner Kamishak Bay	7	11	43	24	19	7	3	4	11	25	38	17	2
Barren Islands	1	1	2	4	15	3	39	1	1	2	3	7	8
Cape Douglas	5	7	18	31	30	64	41	3	6	17	27	46	56
Shuyak Island	1	1	4	4	3	7	13	1	1	2	4	5	10
Hallo/Kukak Bays	2	2	4	8	8	27	26	1	2	5	7	13	33
Kupreanof Strait	1	1	2	4	4	6	7	.	1	2	3	5	8
Katmai Bay	1	1	1	3	3	6	8	1	1	2	2	3	7
Puale Bay	1	1	2	4	4	8	12	1	1	3	4	5	10
Middle Cape	.	.	.	.	.	1	1	.	.	.	.	.	1
Sutwik Island	.	.	.	.	.	1	1	.	.	.	.	1	1
Chignik Bay	.	.	.	.	.	.	1	.	.	.	.	.	1
Semidi Islands	.	.	.	1	.	1	2	.	.	.	.	1	2
Chirikof Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Trinity Islands	.	.	.	.	.	1	1	.	.	.	.	.	1
Twoheaded Island	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Ugak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Cape Chiniak	.	.	.	.	.	.	.	.	.	.	.	.	.
N. Albatross Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Marmot Island	.	.	.	.	.	.	.	.	.	.	.	.	.
Portlock Bank	.	.	.	.	.	.	.	.	.	.	.	.	.
Pye Islands	.	.	.	.	.	.	.	.	.	.	.	.	.
Forelands	.	.	.	.	.	.	.	1	.	.	.	.	.
S. Kalgin	6	8	.	.	1	.	.	19	2	1	.	.	.
S. Shelikof Strait	1	1	2	4	4	9	12	.	1	3	4	6	10
Marmot/Chiniak Bay	.	.	.	.	.	.	.	.	.	.	.	.	.
Kachemak Bay/Outer Peninsula	2	4	.	3	17	.	3	1	4	7	2	3	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table C-4. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	.	.	.	.	5	5	.	.	.	.	1	7
22	Devils Cove, Hallo Bay	.	.	.	.	.	8	5	.	.	.	.	1	8
23	Cape Chiniak, Swikshak Bay	.	.	.	.	.	5	4	.	.	.	.	1	5
24	Fourpeaked Glacier	.	.	1	3	3	17	10	.	.	.	2	7	15
25	Spotted Glacier, Sukoi Bay	1	.	7	12	9	14	5	.	.	4	10	16	5
26	Douglas River	1	1	16	9	5	5	.	.	1	6	16	7	.
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	.	.	11	4	1	1	.	.	.	2	9	2	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	1	1	7	3	1	.	.	.	.	1	5	1	.
29	Augustine Island	5	6	15	10	4	.	.	1	6	8	7	3	.
30	Rocky Cove, Tignagvik Point	4	3	8	3	1	.	.	.	3	2	1	1	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	3	2	5	2	1	.	.	.	2	2	1	.	.
32	Chinitna Point, Dry Bay	7	5	2	2	2	.	.	1	5	3	1	1	.
33	Chinitna Bay	16	11	.	.	1	.	.	7	10	2	.	.	.
34	Iliamna Point	14	9	.	.	.	.	.	19	5	1	.	.	.
35	Chisik Island, Tuxedni Bay	12	6	.	.	.	.	.	16	1	.	.	.	.
36	Redoubt Point	3	2	.	.	.	.	.	5	.	.	.	.	.
38	Kalgin Island	1	1	.	.	.	.	.	2	.	.	.	.	.
43	Clam Gulch, Kasilof								1	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	.	1	.	.	.	.	.	7	.	.	.	.	.
45	Cape Starichkof, Happy Valley	1	5	.	.	.	.	.	5	14	1	.	.	.
46	Anchor Point, Anchor River	1	3	.	.	2	.	.	1	6	2	.	.	.
47	Seldovia	.	2	.	.	2	.	.	.	3	2	.	.	.
48	Nanwalek, Port Graham	.	1	.	.	3	.	.	.	1	2	.	.	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	1	.	1	.	.	.	.	.	.
50	Barren Islands, Ushagat Island	.	.	.	.	1	1	4	.	.	.	.	1	2
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	1	.	.	.	.	.	.
81	Shuyak Island	.	.	.	.	.	1	3	.	.	.	.	1	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	.	.	1	1	.	4	4	.	.	.	1	1	4
83	Foul Bay, Paramanof Bay	.	.	.	1	.	2	2	.	.	.	1	.	2
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	.	.	1	1	.	.	.	.	.	1
85	Kupreanof Strait, Viekoda Bay	.	.	.	.	.	1	.	.	.	.	.	.	.
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	.	.	.	1	.	.	.	.	.	.	.

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent.

Table C-5. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
13	Cape Providence, Chiginagak Bay	.	.	.	.	.	.	1						
14	Agripina Bay, Ashiiak Island, Cape Kilokak	.	.	.	.	.	1	1	.	.	.	.	.	1
15	Cape Kayakliut, Wide Bay	.	.	.	.	.	1	2	.	.	.	1	1	1
16	Cape Kanatak, Cape Unalishagvak, Portage Bay	.	.	.	1	1	1	2	.	.	.	1	1	2
17	Cape Aklek, Puale Bay	.	.	.	.	.	1	1	.	.	.	.	.	1
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	1	1	2	3	.	.	.	1	1	2
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	.	.	2	2	.	.	.	.	1	2
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	.	.	2	2	.	.	.	.	1	2
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	.	1	1	2	2	8	9	.	1	1	2	4	11
22	Devils Cove, Hallo Bay	1	1	1	3	3	10	9	.	.	2	2	5	12
23	Cape Chiniak, Swikshak Bay	.	.	1	2	2	7	6	.	.	1	2	3	8
24	Fourpeaked Glacier	1	1	3	6	6	19	13	.	1	3	5	10	18
25	Spotted Glacier, Sukoi Bay	2	3	9	14	13	14	6	1	3	8	13	19	6
26	Douglas River	3	4	17	11	9	5	1	2	4	11	19	9	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	3	13	8	6	1	1	1	3	8	12	5	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	8	5	4	1	1	1	3	5	8	4	.
29	Augustine Island	7	9	16	12	8	1	1	3	12	13	9	5	1
30	Rocky Cove, Tignagvik Point	6	6	9	4	3	.	1	2	7	5	3	2	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	4	4	5	4	3	.	.	1	5	5	1	1	.
32	Chinitna Point, Dry Bay	8	7	2	4	4	.	.	3	7	6	2	2	.
33	Chinitna Bay	18	14	.	1	3	.	.	11	13	5	1	1	.
34	Iliamna Point	16	11	.	1	1	.	.	21	6	2	.	.	.
35	Chisik Island, Tuxedni Bay	13	7	.	.	.	.	.	18	1	.	.	.	.
36	Redoubt Point	4	3	.	.	.	.	.	6	1	.	.	.	.
38	Kalgin Island	1	1	.	.	.	.	.	4	.	.	.	.	.
43	Clam Gulch, Kasilof	.	1	.	.	.	.	.	2	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	1	.	.	.	.	.	8	.	.	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	.	1	.	.	6	14	2	.	.	.
46	Anchor Point, Anchor River	1	3	.	1	2	.	.	1	6	3	.	1	.
47	Seldovia	1	2	.	1	3	.	.	1	3	3	1	1	.
48	Nanwalek, Port Graham	1	2	.	1	4	.	.	.	1	3	1	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1	.	.	.	.	.	.
50	Barren Islands, Ushagat Island	.	.	1	1	2	1	5	.	.	1	1	3	3
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2						
80	Andreon & Perenosa Bay, Big Fort Island													
81	Shuyak Island	.	.	1	1	1	1	3	.	.	1	1	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	1	3	2	2	5	6	1	1	1	3	3	6
83	Foul Bay, Paramanof Bay	1	1	1	1	1	3	3	.	.	1	1	1	3
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	.	1	1	1	2	.	.	1	1	1	2
85	Kupreanof Strait, Viekoda Bay	.	.	.	1	1	1	2	.	.	1	1	1	2
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	1	1	1	2	2	.	.	1	1	2	3
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	1	1	1	1	.	.	.	1	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	.	.	.	.	.	1	1	.	.	.	.	.	1

Notes: ** = Greater than 99.5 percent;; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table C-6. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Land Segment	Name	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6
13	Cape Providence, Chiginagak Bay	.	.	.	.	.	.	1	.	.	.	.	.	1
14	Agripina Bay, Ashiiak Island, Cape Kilokak	.	.	.	1	1	1	1	.	.	.	.	1	1
15	Cape Kayakliut, Wide Bay	.	.	.	1	1	1	2	.	.	.	1	1	2
16	Cape Kanatak, Cape Unalishagvak, Portage Bay	.	.	.	1	1	2	3	.	.	.	1	1	2
17	Cape Aklek, Puale Bay	.	.	.	1	1	1	2	.	.	1	1	1	2
18	Alinchak Bay, Cape Kekurnoi, Bear Bay	.	.	.	1	1	2	3	.	.	1	1	1	2
19	Cape Kubugakli, Kashvik Bay, Katmai Bay	.	.	.	1	1	2	2	.	.	1	.	1	2
20	Amalik, Dakavak and Kinak Bay, Takli Island	.	.	.	1	1	2	2	.	.	.	1	1	2
21	Kaflia Bay, Kukak Bay, Kuliak Bay, Missak Bay	1	1	1	2	2	8	9	.	1	1	2	4	11
22	Devils Cove, Hallo Bay	1	1	1	3	3	10	9	.	1	2	2	5	12
23	Cape Chiniak, Swikshak Bay	.	1	1	2	2	7	6	.	.	1	2	3	8
24	Fourpeaked Glacier	1	1	3	6	6	19	13	1	1	3	5	10	18
25	Spotted Glacier, Sukoi Bay	2	3	9	14	14	14	7	1	3	8	13	19	6
26	Douglas River	3	4	17	11	9	5	1	2	4	11	19	9	1
27	Akumwarvik Bay, McNeil Cove, Nordyke Island	1	3	13	8	6	1	1	1	4	8	12	5	.
28	Amakdedulia Cove, Bruin Bay, Chenik Head	2	2	9	6	4	1	1	1	3	5	8	4	.
29	Augustine Island	7	9	16	12	8	1	1	3	12	13	9	5	1
30	Rocky Cove, Tignagvik Point	6	7	9	5	3	.	1	3	7	5	3	2	.
31	Iliamna Bay, Iniskin Bay, Ursus Cove	4	4	5	4	3	.	.	1	5	5	1	1	.
32	Chinitna Point, Dry Bay	9	7	2	4	4	.	.	3	7	6	2	2	.
33	Chinitna Bay	18	14	.	1	3	.	.	11	13	5	1	1	.
34	Iliamna Point	16	11	.	1	1	.	.	21	6	2	.	.	.
35	Chisik Island, Tuxedni Bay	13	7	.	.	.	.	.	18	1	.	.	.	.
36	Redoubt Point	4	3	.	.	.	.	.	6	1	.	.	.	.
38	Kalgin Island	1	1	.	.	.	.	.	4	.	.	.	.	.
43	Clam Gulch, Kasilof	.	1	.	.	.	.	.	2	.	.	.	.	.
44	Deep Creek, Ninilchik, Ninilchik River	1	1	.	.	.	.	.	8	.	.	.	.	.
45	Cape Starichkof, Happy Valley	2	6	.	.	1	.	.	6	14	2	.	.	.
46	Anchor Point, Anchor River	1	3	.	1	2	.	.	1	6	3	1	1	.
47	Seldovia	1	2	.	1	3	.	.	1	3	3	1	1	.
48	Nanwalek, Port Graham	1	2	.	1	4	.	.	.	1	3	1	1	.
49	Elizabeth Island, Port Chatham, Koyuktolik Bay	.	.	.	.	2	.	1	.	.	.	.	.	
50	Barren Islands, Ushagat Island	.	1	1	1	2	1	5	.	.	1	1	3	3
51	Amatuli Cove, East and West Amatuli Island	.	.	.	.	.	.	2						
81	Shuyak Island	.	.	1	1	1	1	3	.	.	1	2	2	2
82	Bluefox Bay, Shuyak Island, Shuyak Strait	1	1	3	2	2	5	6	1	1	2	3	3	6
83	Foul Bay, Paramanof Bay	1	1	1	1	1	3	3	1	1	1	2	1	3
84	Malina Bay, Raspberry Island, Raspberry Strait	.	.	1	1	1	2	2	.	.	1	1	1	2
85	Kupreanof Strait, Viekoda Bay	.	.	.	1	1	1	2	.	.	1	1	1	2
86	Uganik Bay, Uganik Strait, Cape Ugat	.	.	1	1	1	2	2	.	.	1	2	2	3
87	Cape Kuliuk, Spiridon Bay, Uyak Bay	.	.	.	1	1	1	1	.	.	1	1	1	1
88	Karluk Lagoon, Northeast Harbor, Karluk	.	.	.	1	.	1	1	.	.	.	1	1	1

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table C-7. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 3 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table C-8. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 10 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

Table C-9. Winter conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain boundary segment within 30 days, Cook Inlet Planning Area, OCS Lease Sales 191 and 199.

Boundary Segment	LA 1	LA 2	LA 3	LA 4	LA 5	LA 6	LA 7	P 1	P 2	P 3	P 4	P 5	P 6

Notes: ** = Greater than 99.5 percent; . = less than 0.5 percent. Rows with all values less than 0.5 percent are not shown.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.