Chapter 7: Mitigation Measures and Monitoring Programmes

7.1 Introduction

Measures have been undertaken (during Phase 1) and will be undertaken (during the continuation of Phase 1 and Phase 2) by SEIC to mitigate the potential impacts of their operations on the western gray whale. Some of the measures have been built in to the project design, in part through analysis of alternative options (see Chapter 6), including type of equipment, procedures, and environmental management plans. The measures are described in Chapters 2 and 3, and are not considered to be mitigation measures in this EIA. The discussion below outlines the various mitigation and protection measures designed to address potential impacts outlined in Chapter 5, wherein impact assessment assumed that the built-in measures were in place. As discussed in Section 5.2 (Impact Assessment Methodology), the goal of mitigation measures is to reduce major impacts to moderate or negligible, and to reduce moderate impacts to "as low as reasonably practical" (ALARP) levels. Negligible impacts and impacts classified as being 'no impact' do not require mitigation.

Mitigation measures are often based on past knowledge of the potential impacts on an organism, or extrapolated from studies on other similar species. Monitoring programmes provide up-to-date information on the present situation, and when viewed in the context of current operations and new information about western gray whales, can help determine the effectiveness of mitigation measures and whether additional mitigation measures are warranted.

7.2 Construction and Exploration

7.2.1 Impacts from Underwater Construction

Impacts of temporary disruption of seafloor habitat as a result of the construction of the pipeline shore approach extending from Piltun landfall to the PA-A platform site are predicted to be of low magnitude, sub-local to local geographic extent, and long duration, thus, *moderate*. Mitigation of those impacts is impractical, and the impact is, therefore, ALARP.

7.2.2 Impacts of the Physical Presence of Vessels

Impacts from collisions with vessels may range from low to high magnitude and can occur over the medium to long-term, at a regional geographic scale, thus are *major*. Mitigation measures are as follows:

- Vessels will not traverse the nearshore Piltun or offshore Chayvo feeding areas unless essential for safety or specifically required and authorised. Appropriate navigational corridors will be defined for that purpose.
- Vessels underway at night and during periods of low visibility within known feeding areas will adhere to speed restrictions.
- Marine mammal observers (MMOs) will be placed on all key vessels.
- A visual lookout for marine mammals by a dedicated observer is to be maintained while vessels are underway. When a whale is sighted in the project area, vessel operator(s) will record the date, time, location of sighting,

direction of travel, species identification, and number of marine mammals if known. They will then notify other vessel traffic in the vicinity, as well as the platforms and the Offshore Operations Manager (OOM). Operations are altered as necessary to minimize disturbance and avoid physical impact on marine mammals. Mitigation actions taken are then recorded.

- Vessels will attempt to maintain a minimum of 1,000 m separation from western gray whales or any other large whales, and a separation distance of 500 m will be maintained for all other marine mammals including pinnipeds. If any whale is heading for the vessel, the vessel will, if possible, take precautionary measures and, divert, if necessary slow down or stop, until it has been determined that the potential danger to the marine mammal has passed. It is noted that manoeuvring options would be limited for heavy transport such as vessels towing barges, but in those cases normal movements are already slow and deliberate, and unlikely to pose a collision risk for western gray whales, or to seriously disturb them
- Support vessels will not cross directly in front of or in the immediate vicinity of moving or stationary whales. When moving parallel to whales, support vessels will operate at a constant speed no faster than the whales.

7.2.3 Noise

7.2.3.1 Pipeline/Cable Installations

Impacts from noise associated with pipeline/cable installation on western gray whales are predicted to be of high magnitude, medium to long-term, at a district geographic scale. Those predictions constitute a potentially *major* impact. Mitigation measures are as follows:

- A restricted construction dredging season in the Lunskoye from July-August, when most western gray whales are farther north, will be investigated.
- There is no ideal time during the open-water season for dredging in the nearshore Piltun area, where migrating western gray whales are expected to occur in May-June and October-December, and where at least small numbers are present in July-September. There may also be movements of western gray whales across the pipeline route from PA-B to shore if some whales move back and forth between the two feeding areas (presently not documented). Especially in the southern Piltun area, alternative mitigation measures aside from seasonal timing will be required, particularly during May-June when western gray whales are arriving. Aerial surveys will be conducted on a regular basis to document the number of migrating whales that are approaching or in the area. If western gray whales are apparently being blocked or deflected from their regular migratory path because of dredging near the PA (or Lunskoye) sites, then those activities may be suspended, insofar as possible, for a period long enough for the whales to be able to enter their feeding areas.
- Marine mammal observers (MMOs) will be placed on all key vessels, locations, and activities.
- Operators of dredges, pipe-laying vessels, impact pile-driving equipment working adjacent to the sea, and any other major construction activity, are to

conduct a specific visual search of the area, monitored by a Marine Mammal Observer, prior to onset of operations. If whales are observed in close proximity, startup of the operation should be delayed, if possible, until the whale moves away.

- Operations involving excessively noisy equipment are, where feasible, to "ramp-up" sound sources, much as seismic operators do when employing "soft-start" procedures. This will allow any nearby marine mammals that are disturbed to move away before they are exposed to maximum sound levels.
- Potentially-disturbing operations will be avoided at night or in poor visibility. It is noted, however, that certain major activities such as dredging and pipelaying will be ongoing on a 24-hour basis. In such cases where operations at night are unavoidable, additional precautions will be taken, including increased bridge watch, use of spotlights, and reduced speed.
- Contractors will be requested and encouraged to use equipment and procedures that minimise noise. Possible options include use of special enclosures, mufflers, sound-isolation mounts, tuned propellers and drive shafts, and shrouds on propellers, along with minimal use of thrusters.

7.2.3.2 GBS and Topsides Installation

Impacts from noise associated with GBS and topside installations on western gray whales are predicted to be of high magnitude, medium-term, at a district geographic scale. Thus, impacts on western gray whales likely will be *moderate*. Mitigation measures will include those for vessels (Sections 7.2.3.4 and 7.3.2.4) and platforms (Section 7.3.2.2).

7.2.3.3 Landing Pier and Approach Channel Construction

If western gray whales do migrate past Lunskoye, which is likely but not confirmed, impacts from noise associated with landing pier and approach channel construction are predicted to be of high magnitude, medium-term, and at a regional geographic scale. Thus, potential impacts on western gray whales likely will be *major*. Mitigation measures are as follows:

- Impact pile driving in or alongside water is a major point source of noise. Avoiding that noise source onshore by method selection may provide mitigation. Vibratory piling (Vibropile) produces less noise, and may be a viable alternative. Bidders who offer low-noise options will be given preference.
- The preferred timing for the construction of the landing pier and channel would be late-July through August, after most western gray whales have passed northward and have occupied summer feeding areas. That period is possibly better than the one scheduled earlier, when whales are still migrating along the coast toward their known feeding areas.
- Aerial surveys will be conducted on a regular basis to document the number of migrating whales that are approaching or in the area. If western gray whales are apparently being blocked or deflected from their regular migratory path because of dredging or piledriving, then those activities may be suspended, insofar as possible, for a period long enough for the whales to be able to pass the area.

- Marine mammal observers (MMOs) will be placed on all key vessels, locations, and activities.
- During construction operations, including dredging, pipelaying and piledriving, a visual watch by a Marine Mammel Observer is to be maintained for marine mammals in close proximity to the Work Site. If a mammal is seen in circumstances where it might be at risk, the operator should take whatever practical action is feasible to reduce risk to the animal, e.g. temporarily suspend impact piledriving.
- Operations involving excessively noisy equipment are, where feasible, to "ramp-up" sound sources, much as seismic operators do when employing "soft-start" procedures. This will allow any nearby marine mammals that are disturbed to move away before they are exposed to maximum sound levels.
- Potentially-disturbing operations will be avoided at night or in poor visibility.
- Contractors will be requested and encouraged to use equipment and procedures that minimise noise. Possible options include use of special enclosures, mufflers, sound-isolation mounts, tuned propellers and drive shafts, and shrouds on propellers, along with minimal use of thrusters.

7.2.3.4 Vessels

Impacts from noise generated by vessel traffic associated with the construction phase of the Sakhalin II project are predicted to range from low to high magnitude, during a long duration, and at a local to district geographic scale. Thus, impacts on western gray whales likely will be *moderate*. Most of the mitigation measures for avoidance of collisions between vessels and western gray whales, described in Section 7.2.2, are also relevant for mitigation of noise impacts. Others relevant only to noise issues, not avoidance of collisions, are as follows:

- Contractors will be requested and encouraged to use equipment and procedures that minimise noise. Possible options include use of special enclosures, mufflers, sound-isolation mounts, tuned propellers and drive shafts, and shrouds on propellers, along with minimal use of thrusters.

7.2.3.5 Helicopters

Impacts from noise generated by helicopters associated with the Sakhalin II project are considered to range from medium to high magnitude, during a long duration, and at a district geographic scale. Thus, impacts on western gray whales likely will be *moderate*. Mitigation measures are as follows:

- Areas used by western gray whales for feeding will be avoided by all types of aircraft whenever possible.
- Helicopters will maintain a minimum altitude of not less than 500 m over western gray whale feeding areas, subject to pilot safety requirements.
- Aircraft will be prohibited from flying over or circling wildlife for the purposes of casual viewing.

7.2.4 Seismic Surveys

If western gray whales are feeding near the survey area, impacts of the Lunskoye seismic survey are predicted to be medium to high magnitude, during a medium duration, at a regional geographic extent. Based on previous survey observations, few whales are expected to be within the field between July and September, however, there is a possibility that new data will show that whales are feeding during this period. The assessment of potential impacts therefore requires a precautionary approach to be taken, which has resulted in the prediction of *major* potential impacts on any feeding western gray whales that may be present within the field.

Intensive baseline surveys of the Lunskoye area were conducted during the summer of 2002. Several western gray whales were seen there in July and August but there was no evidence of feeding. If those limited observations can be taken as evidence that western gray whales do not feed there, a summer seismic survey is expected to have at most a *moderate* impact on feeding western gray whales.

The seismic survey is planned to begin in July or August 2003, when few if any western gray whales are expected to migrate through the Lunskoye area. In the unlikely event that migrating western gray whales occur in the Lunskoye area during the period of seismic operations, impacts are predicted to be medium to high magnitude, during a short or medium duration, on a local or district geographic extent. Thus, impacts on migrating western gray whales are likely to be *moderate*.

The most current guidelines for minimising acoustic impacts to marine mammals (JNCC 1998; HESS 1999; NMFS 1999, 2000a,b; Environment Australia 2001; Lawson 2002; MMS 2002) have been used to develop mitigation measures for the seismic survey planned for the Lunskoye Licence Area in 2003. The mitigation measures developed for the Lunskoye seismic survey are described in the sections below.

7.2.4.1 Seasonal Restrictions

The seismic survey needs to be conducted during the open-water season, i.e. between May and November. Operations will be conducted during July, August, or September (preferably August) when most western gray whales are feeding to the north, off Chayvo and Piltun bays.

7.2.4.2 Aerial Surveys

Periodic aerial surveys of the planned seismic-survey area are being conducted during the 2002 open water season – the year preceding the planned seismic survey – to characterise seasonal use of the area by western gray whales and other marine mammals.

Aerial surveys of the regional distribution and abundance of the whales will be conducted in 2003 before the seismic survey starts and periodically during and after the survey. The objectives are (1) to provide real-time or near real-time information that can be used (if appropriate) to alter the survey's starting point and survey line sequence based on actual distribution of whales in the area immediately prior to and during surveys (see below), and (2) to document the numbers of whales exposed to seismic surveys and their responses to the surveys.

Aerial surveys should be conducted only when they can be carried out in a safe manner and during periods of good visibility where there is a greater probability of detecting western gray whales and other marine mammals.

7.2.4.3 Airgun Array Size and Configuration

The airgun array will be configured to maximise the proportion of the energy that is directed downward and to minimise horizontal sound propagation. In particular, closely-spaced airguns whose overall radiation pattern is nearly omnidirectional will be avoided. The size of the airgun array(s), as measured by the source level, will not be any larger than required to meet SEIC's objectives for the seismic survey.

7.2.4.4 Shipboard Marine Mammal Observers

If western gray whales are feeding in the Lunskoye area, boat-based studies of their behaviour will be conducted during the seismic programme to document any changes in normal feeding behaviour by the whales.

One or more trained marine mammal observers (MMOs) on the seismic ship and, optionally, on an accompanying support vessel, will be on watch for marine mammals during all daylight hours when seismic operations are in progress. (That will require at least two and preferably three observers per vessel, given that observer efficiency deteriorates after approximately 4 h, and that having two observers on watch simultaneously increases the probability of sighting the marine mammals present near the vessel.) MMOs would be stationed on the support vessel as well as the seismic ship if aerial surveys in 2002 indicate that the Lunskoye area is used regularly by western gray whales or other endangered whales during the time of year when the seismic project is conducted. In selecting seismic and support vessels for the programme, SEIC will take account of the requirement to accommodate 2-3 MMOs on each vessel.

The purpose of the observers on the seismic vessel, and possibly the support vessel, will be to document the occurrence and responses of marine mammals visible from the vessel, and to help implement airgun shutdown requirements and any other agreed-upon actions when a marine mammal is observed.

When a marine mammal is sighted within or approaching the safety zone around the airgun array, the MMOs will notify the seismic contractor who will shut down the airguns. After completion of the survey, a technical report and a scientific research paper will be prepared to summarise the observations, results, and conclusions of the marine mammal monitoring programme.

7.2.4.5 Ramp Up or Soft Start

The seismic operator will ramp up airguns slowly over a period of 20 minutes each time shooting begins, especially if the shut-down period has been substantial, i.e., >10 minutes. Ramp up will follow every interruption of the survey, most importantly if the survey is discontinued until marine mammals leave the safety zone. The seismic operator and MMOs will maintain records of the times when ramp ups start, and when the airgun array reaches full power.

7.2.4.6 Safety Distance

Initial safety zones will be established prior to the survey based on available data and modelling concerning sound output, based on the assumption that seismic pulses at broadband received levels above 190 dB re 1 μPa (rms over duration of pulse) for pinnipeds or above 180 dB re 1 μPa rms for cetaceans should be avoided whenever possible because those levels might affect hearing abilities at least temporarily. The safety radii for pinnipeds and cetaceans at these two respective received levels (190 and 180 dB) are expected to be on the order of 250 m and 1 km, respectively.

If aerial or other surveys of the Lunskoye area in 2002 or 2003 show the seismic-survey area to be a regular feeding area for western gray whales during the date-range of the seismic survey, then a more precautionary shutdown criterion than the aforementioned 180 dB distance will be adopted for western gray whales, i.e. the 163 dB re 1 μPa rms level described above. With a 47.5-L array, the distance likely would be 6-7 km.

The safety distances will be verified (and if necessary adjusted) during the first week of the seismic survey, based on direct measurements via calibrated hydrophones of the received levels of underwater sound vs. distance and direction from the airgun array. The acoustic data will be analysed quickly in the field and used to adjust safety distance. The same acoustic data will be useful in interpreting observations of marine mammals during analysis of sighting data after programme completion.

If marine mammals enter the safety radii, airgun operation will be suspended until the marine mammals have left the safety radii.

7.2.4.7 Operations at Night and in Poor Visibility

Seismic activities will not start during darkness or during conditions when visibility is reduced to less than the radius of the safety zone. Seismic operations may continue under conditions of darkness or reduced visibility unless, in the judgement of the MMOs, densities of endangered cetaceans in the operations area are high enough to warrant concern that an endangered cetacean is likely to enter the safety zone undetected. In that case, the MMOs will advise the Captain to halt airgun operations, or to move to a part of the survey area where visibility is adequate or where the likelihood of encountering an endangered cetacean is low based on aerial- and vessel-based surveys that would be part of the real-time monitoring programme.

7.3 Operations

7.3.1 Presence of Vessels

Impacts from collisions with vessels during the operations phase of the project may range from low to high magnitude and can occur over the very long-term, at a regional geographic scale, thus are *major*. Mitigation measures are described in Section 7.2.2, under “Construction and Exploration”.

7.3.2 Noise

7.3.2.1 Drilling

Impacts of drilling noise are predicted to of low magnitude, sub-local to local, and intermittent over the very long term, thus, *moderate*. Mitigation of impacts of drilling noise is not possible, and the residual impact is, therefore, considered ALARP.

7.3.2.2 Platforms

Impacts of noise generated from the platforms are predicted to be of low magnitude, sub-local to local, and intermittent over the very long term, thus, *moderate*. Mitigation measures are as follows:

- Insofar as possible, for all offshore structures, the most effective possible enclosures and mufflers will be used on air intakes and exhaust outlets for gas turbines or other engines, and the most effective sound isolation mounts will be used to isolate machinery from the primary structure.

7.3.2.3 Maintenance of Subsea Structures

Impacts of platform maintenance are predicted to be of low magnitude, sub-local to local, and intermittent over the very long term, thus, *moderate*. No specific mitigation measures are planned, but those described for mitigating impacts of noise from vessels (Sections 7.2.3.4 and 7.3.2.4), helicopters (Section 7.2.3.5), and platforms (Section 7.3.2.2) will reduce noise associated with maintenance activities.

7.3.2.4 Vessels

Overall, noise from vessel traffic during the operational activities is expected to have potential impacts of low to high magnitude, over a local to district geographic scale, and over the very long term. Thus, impacts on western gray whales likely will be *moderate*. Mitigation measures are the same as those described for the construction phase in Sections 7.2.2 and 7.2.3.4.

7.3.2.5 Helicopters

Impacts from noise generated by helicopters during the operations project are predicted to range from medium to high magnitude, during a very long duration, and at a district geographic scale. Thus, impacts on western gray whales likely will be *moderate*. Mitigation measures are the same as those described for the construction phase in Section 7.2.3.5.

7.4 Oil Spills

In compliance with Russian federal laws and resolutions and Sakhalin Island decrees, and guided by international best practice and lessons learned from the implementation of Phase I, SEIC has developed Oil Spill Response (OSR) Plans for each of the facilities, or assets, that it proposes to operate under Phase II of the project: PA-B; LUN-A; OPF; OET; TLU and the offshore and onshore pipeline transfer system.

In addition, SEIC has also prepared a Corporate OSR Masterplan (COSRP) (SEIC 2002). Key elements of the oil spill response plans are as follows:

- dedicated oil spill response resources located at and close to the production field. During tankering, an oil spill response vessel is on standby and additional craft and equipment are located in a shore base near Nogliki on the coast;
- implementation of an oil spill tracking system based on direct tracking by boats and a forecasting system using current weather, current, and spill data;
- a response philosophy based on priority protection of identified sensitive areas, primarily the bays and lagoons;
- co-operation agreements with the local authorities regarding spill notification and progress reporting; and
- possible use of dispersants.

The oil spill response plans are built in to the project design, therefore they are not considered to be mitigation measures in this EIA. In general, the plans will prevent major impacts to the marine environment. However, the plans do not specifically address western gray whales, so potential impacts on western gray whales could be major. Additional measures to mitigate impacts on western gray whales are as follows:

- The oil spill response plans should be updated to implicitly identify western gray whale migration routes and feeding areas as "Areas of Special Value", and should be updated as new information on migration routes and feeding areas becomes available;
- The Emergency Oil Spill Response Coordinator and other senior response personnel should be knowledgeable about western gray whales, especially their distribution while in the project area;
- The oil spill response plans should include specific plans for moving the dedicated oil spill response resources currently located at Nogliki to the Piltun Bay area in the event of a major oil spill, and deploying it to protect the western gray whale feeding area there;
- The only practical measures to protect feeding western gray whales are containment and cleanup of oil before it reaches the feeding areas, and surrounding the feeding areas with booms to keep oil out. Enough booms should be on site for that eventuality. Use of dispersants or heavy equipment or burning of oil in the feeding areas should be avoided.
- Protection of the nearshore feeding area off Piltun Bay should be included in oil spill response exercises, without actually performing exercises in the feeding area;
- The oil spill response plans should include reference to implementation of all other mitigation measures designed to reduce the impacts of noise, disturbance, collisions, entanglements, associated with any oil spill clean-up activities that are likely occur if there is an oil spill;
- Specific western gray whale monitoring programmes should be implemented in the event of an oil spill with potentially major impacts on western gray whales. Two major objectives of the monitoring programmes would be to

direct oil spill response activities, and to determine the real impacts of the spill on western gray whales. The monitoring programmes may include, but may not be limited to, aerial surveys, vessel-based surveys, behaviour surveys, tissue sampling, photo-identification studies, and prey studies (see Section 7.5 for details); and

- An emergency plan should be developed to deal with a situation involving death or injury of a western gray whale that may have occurred, or be perceived to have occurred, as a result of SEIC activities.

7.5 Western Gray Whale Monitoring Programmes

SEIC initiated studies of western gray whales on the northeast Sakhalin Shelf in 1996, when it contracted Russian and Western scientists to conduct information and literature reviews of all marine mammals likely to be present in the Sakhalin II lease area. In 1997, SEIC, in cooperation with Exxon Neftegas Limited (ENL), provided further support for western gray whale monitoring studies by providing a contract to Texas A&M University (TAMU) and the Kamchatka Institute of Ecology and Nature Management (KIENM) to conduct gray whale monitoring as part of the Marine Mammal Project under Area V: Protection of Nature and the Organization of Reserves within the U.S.-Russia Agreement on Cooperation in the Field of Environmental Protection. The Area V joint US-Russian environmental cooperation agreement was administered through the Gore-Chernomyrdin and later Gore-Kasyanov Committee. The Area V studies continue today, although they are not administered through Gore-Kasyanov. SEIC, in cooperation with ENL in some years, has continued to contribute to this monitoring programme through 2002.

Over the years, the total suite of studies that has been conducted as part of this programme includes (1) aerial surveys, (2) photo-identification surveys, (3) acoustic measurements, (4) behaviour observations, (5) food studies, and (6) literature/information reviews. The joint US-Russian team comprised of scientists from TAMU, KIENM, and the Pacific Research Institute of Fisheries and Oceanography (TINRO) performed most of the research during 1997 and 1998, and TAMU and KIENM continued to conduct monitoring studies in 1999, 2000, and 2001 (Würsig *et al.* 1999, 2000; Weller *et al.* 2000, 2001b, 2002b). A Russian team of scientists from the Institute of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok (IBM), and the Pacific Oceanological Institute, Vladivostok (POI), was contracted to conduct additional monitoring (systematic offshore and nearshore aerial surveys and a comprehensive acoustics monitoring programme, respectively) in 1999 and 2000 (Sobolevsky 2000, 2001), and gray whale food studies in 2000 (Phase 1, information review: Kussakin *et al.* 2001) and 2001 and 2002 (field sampling programmes).

International experts on marine mammals and gray whales have periodically met and made independent recommendations about the types of studies that should be conducted to better understand and protect western gray whales. In 1997, marine mammal scientists with the Marine Mammal Research Program, TAMU, and the U.S. National Marine Fisheries Service (La Jolla, California) (NMFS) independently recommended a suite of potential monitoring studies for western gray whales on the northeast Sakhalin Shelf. In 1999, a panel of gray whale experts was convened by NMFS to independently review 1) the status of western gray whales, 2) human-related threats to the population, and 3) research and monitoring needs. Further monitoring recommendations for western gray whales were developed at that meeting. In 2001, SEIC solicited and received

recommendations for future western gray whale monitoring from marine mammal specialists at TAMU, KIENM and IBM. Those and other recommendations from Russian marine mammal specialists have led to the development of the current programme of monitoring studies.

In 2002, costs of all field studies (see further below) except those at the Lunskoye Licence Area are being shared by SEIC and ENL.

7.5.1. Literature/Information Reviews

Since 1997, SEIC has contracted an outside consulting company (LGL Limited) with significant marine mammal expertise and considerable experience developing and conducting marine mammal monitoring programmes for the petroleum industry (in North America and elsewhere) to review and advise on marine mammal issues relative to the Sakhalin II Project. LGL biologists have helped develop scopes of work, reviewed and commented on various contract reports, provided advice and assistance on other technical matters related to marine mammals and petroleum development on the northeast Sakhalin Shelf, prepared a western gray whale protection plan (SEIC 2001).

In 1996, a series of background reports on the current status of marine mammals, sea birds, and the impacts of potential oil industry activities on the biota of the northeastern Sakhalin shelf was completed on behalf of SEIC (Perlov *et al.* 1996). All subsequent studies have also involved reviews of published and unpublished literature and information related to the specific topic(s) of study. The recently-completed literature and information review on the benthic feeding environments of eastern and western populations of gray whales (Kussakin *et al.* 2001) is the most comprehensive document to date on this subject, especially for the Russian literature.

All of the information reported in the various literature reviews has direct relevance to some or all of the various mitigation measures implemented by SEIC to reduce impacts on western gray whales.

Several literature reviews and assessments are being prepared on behalf of SEIC in 2002-2003: a western gray whale EIA, the Lunskoye seismic survey EIA, an update of the *Western Gray Whale Protection Plan* to cover Phase I and II of the project, a review of the distribution of marine mammals in Aniva Bay, and a *Western Gray Whale Summary Research and Monitoring Report*.

7.5.2. Aerial Surveys

In summer 1997 and 1998, opportunistic and other systematic aerial surveys in nearshore waters seaward of the Piltun Bay area were conducted during the course of other marine mammal research activities (Würsig *et al.* 1999, 2000). Only five western gray whales were recorded during 1997 because of the very restricted area surveyed during the one opportunistic flight conducted in July. Three systematic aerial surveys were conducted in the Piltun area during August and September 1998. A maximum of 15 western gray whales was recorded during the survey on 29 September.

During 1999 and 2000, systematic aerial surveys of extensive and intensive sampling grids were conducted in nearshore and offshore waters of northeast Sakhalin Island (Sobolevsky 2000, 2001). The systematic surveys documented the regional and local

distributions of feeding gray whales and corroborated earlier findings (Würsig *et al.* 1999, 2000) that the majority of western gray whales aggregated in waters generally less than 20 m deep offshore from the Piltun Bay area, although some western gray whales have been observed feeding in deeper offshore waters (30-50 m). The maximum number of western gray whales recorded on any single survey in 1999 or 2000 was 45 individuals, and the estimated size of the gray whale population in that area (based on aerial surveys) was estimated to be approximately 100 individuals (Sobolevsky 2000, 2001).

In 2001, an extensive programme of aerial surveys of the Piltun feeding area and the broad-scale coastal area from south of Nogliki to north of Okha was conducted by ENL as part of their monitoring programme associated with seismic surveys near Piltun Bay. Late in the season, after 10 September 2001, aerial surveys were also conducted in a new western gray whale feeding area observed approximately 30 km seaward of Chayvo Bay. In 2002, systematic intensive (100% coverage) sampling grids were surveyed monthly in the Piltun and Offshore feeding areas and at the Lunskoye License Area (Figures 7-1 to 7-3). An extensive (20%) coverage grid was surveyed from shore to 40 km offshore, from ~50 km south of the planned LUN-A platform to ~115 km north of the planned PA-B platform (Figure 7-4). Surveys began in late July and were conducted until November.

Aerial surveys are conducted to determine the number of western gray whales and other whales present in the area, and to determine their temporal and spatial distributions in relation to SEIC activities. That information is important to SEIC in planning future exploration and production programmes, and in evaluating existing mitigation and protection measures for western gray whales. Specifically, aerial surveys help define the extent of feeding areas so that appropriate mitigation measures can be developed for various operations that could potentially affect the feeding habits and habitat of gray whales (e.g., dredging, construction, vessel traffic, aircraft flights) if such operations are to be carried out in known feeding areas.

In 2003 and subsequent years, the same systematic aerial survey programme as in 2002 (see above) will be conducted, with the exception that surveys will begin in May to document northward migration of western gray whales along the northeast coast of Sakhalin Island. Aerial surveys will also be conducted on a frequent basis (sometimes daily) in association with the Lunskoye seismic survey and major construction activities (see Section 7.1) to document the reactions of western gray whales and other marine mammals. If the movement of western gray whales appears to be blocked or feeding disrupted by construction or exploration activities, SEIC will be informed so that mitigation measures (e.g., suspension of works) can be taken.

7.5.3. Vessel-Based Marine Mammal Monitoring

For some types of noisy industry activities that may disturb or injure marine mammals, such as seismic surveys, noisy vessel activities, pipe-laying, pile-driving, and dredging, it is necessary to have experienced marine mammal observers (MMOs) on the vessels to make systematic observations to document the presence/absence of marine mammals near the noisy activities and to invoke pre-arranged mitigation measures. In 2001, as part of the ENL Odoptu seismic monitoring programme, trained Russian marine mammal observers were present on the seismic vessel and on the two seismic support vessels to document marine mammals and to insure that the mitigation plan was followed. The vessel-based programme of surveys discovered the new western gray whale feeding area (Offshore Area) ~30 km offshore from Chayvo Bay.

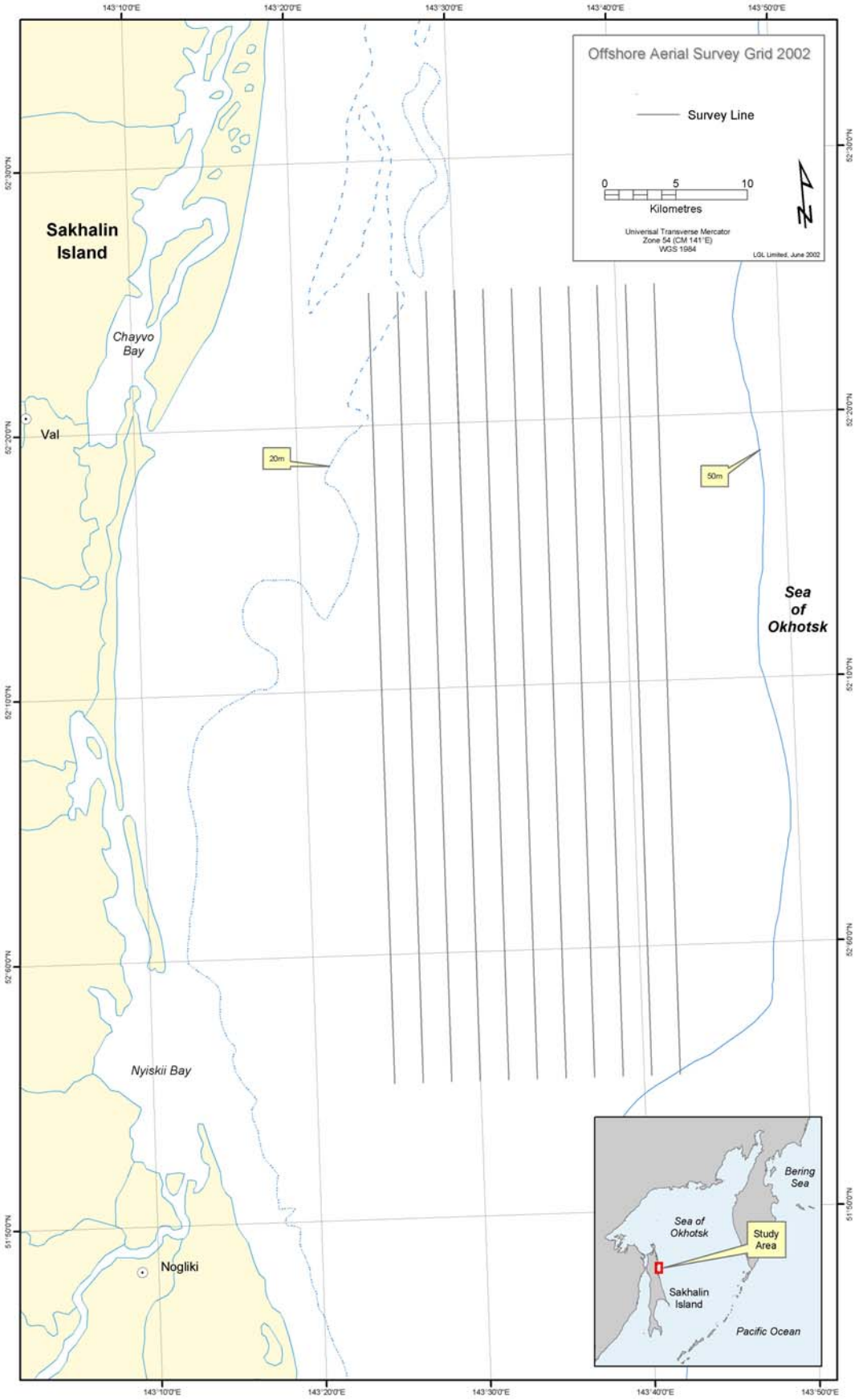
Offshore Aerial Survey Grid 2002
Survey Line
0
5
10
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, June 2002
Sakhalin Island
Chayvo Bay
Val
20m
50m
Sea of Okhotsk
Nyiskii Bay
Nogliki
Bering Sea
Sea of Okhotsk
Study Area
Sakhalin Island
Pacific Ocean
143°10'0"E
143°20'0"E
143°30'0"E
143°40'0"E
143°50'0"E
52°30'0"N
52°20'0"N
52°10'0"N
52°0'0"N
51°50'0"N

FIGURE 7-1. Intensive aerial survey grid for the western gray whale feeding area off Piltun Lagoon.

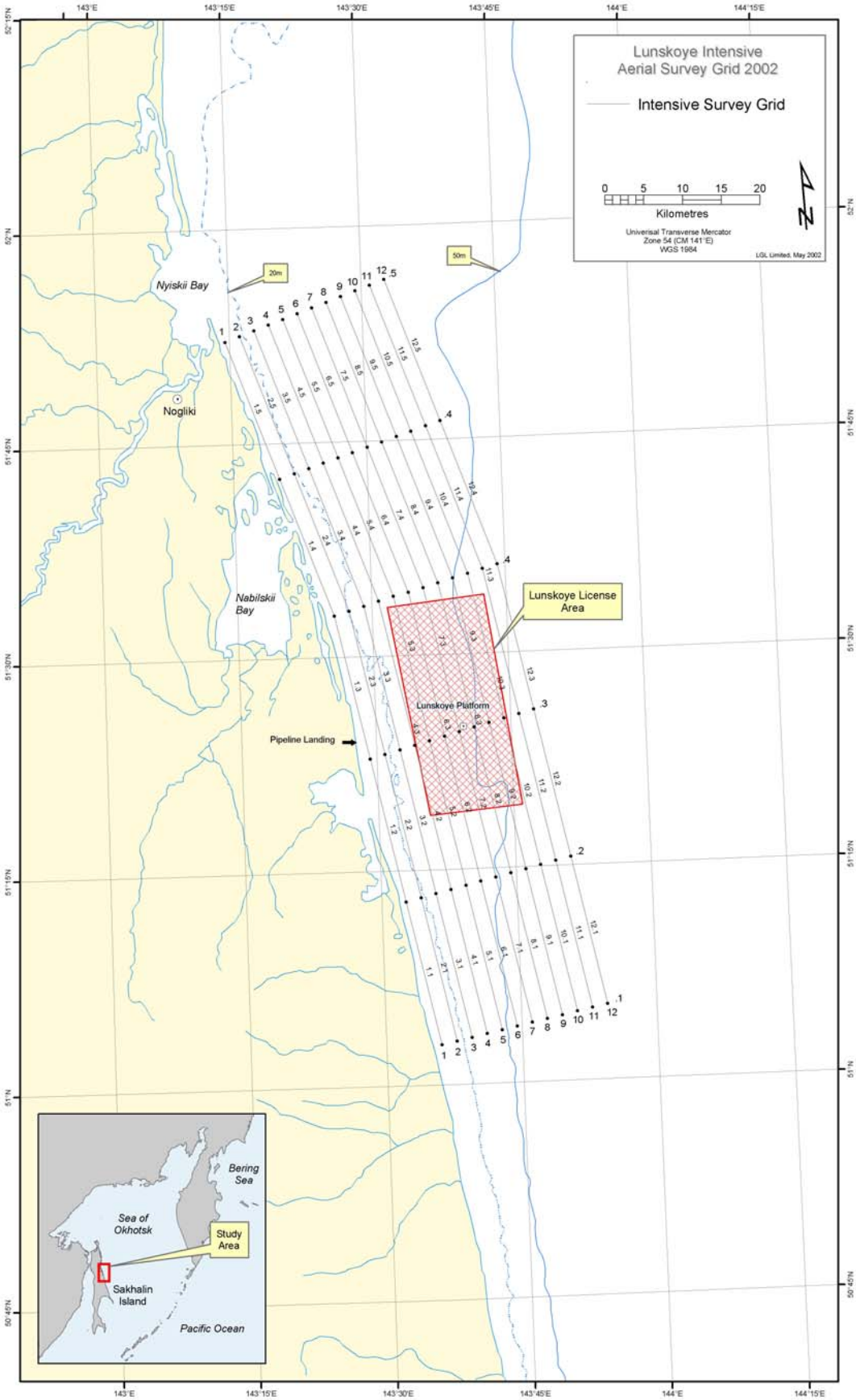

FIGURE 7-2. Intensive aerial survey grid for the western gray whale feeding area offshore from Chayvo Bay.

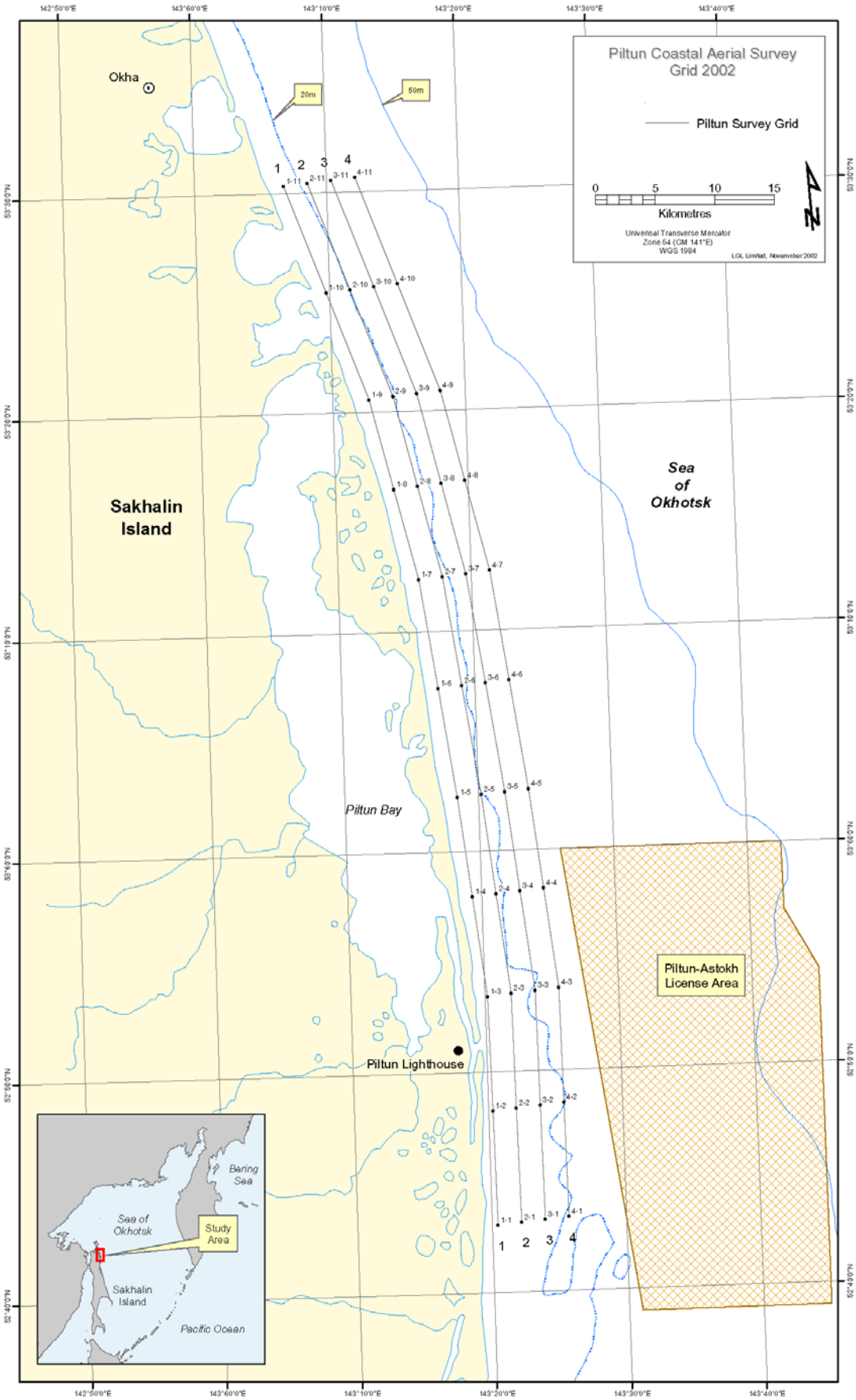

FIGURE 7-3. Extensive aerial survey grid for the Sakhalin II project area.

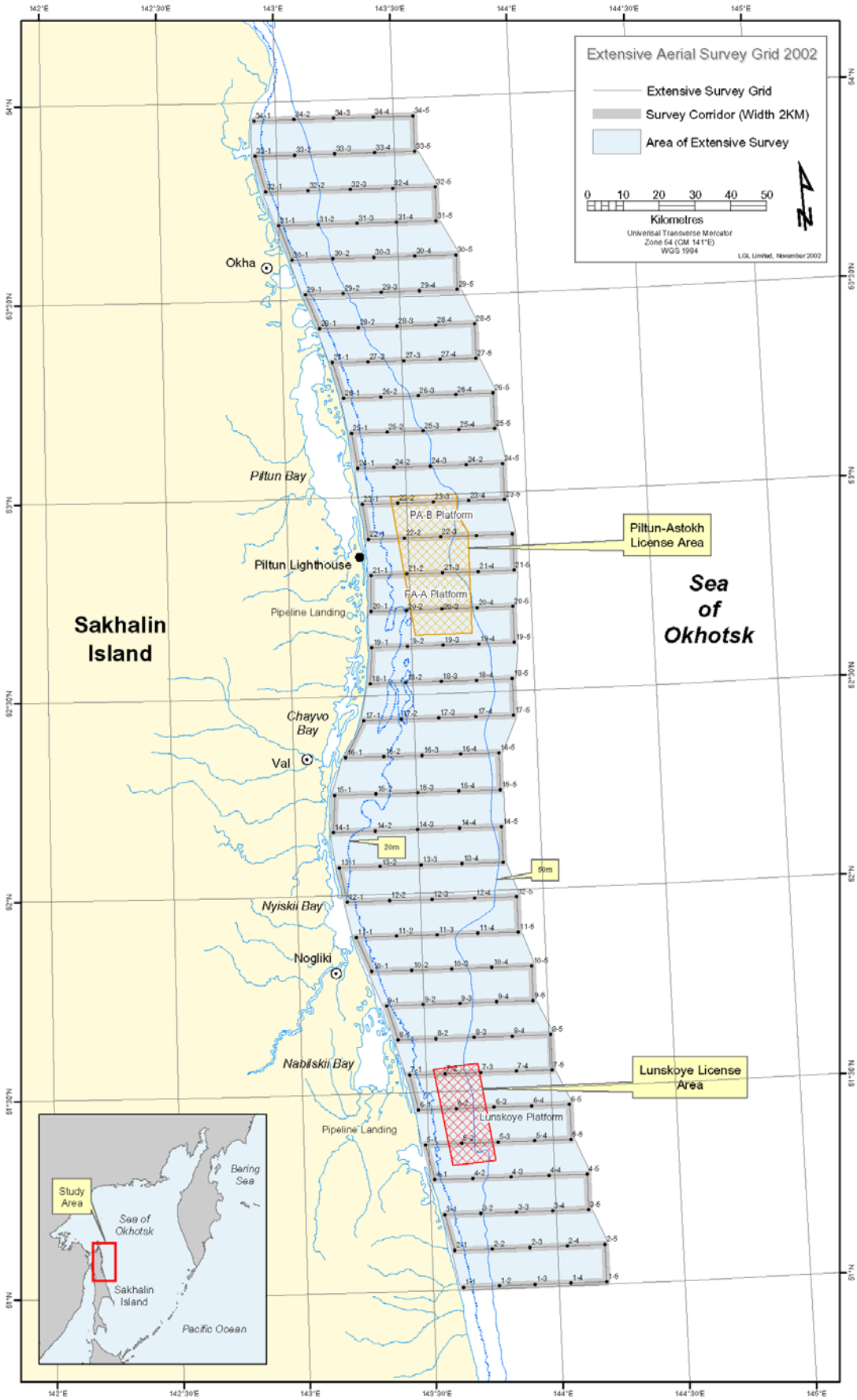

FIGURE 7-4. Intensive aerial survey grid for the Lunskoye Licence Area.

In 2002, experienced Russian MMOs were present on the research vessel *Nevelovsky* from which IBM was also conducting photo-identification and western gray whale prey studies at the Piltun and Offshore feeding areas. Observations were made every day, and systematic transects were surveyed every week. The vessel-based studies began in late September and continued until mid-October.

Marine mammal observers carefully document all marine mammals recorded from the vessels, and collaborate with the vessel operators to reduce noise, i.e. shut down or reduce noisy activities, when marine mammals are sighted within pre-established buffer or safety distances.

In 2003 and subsequent years, MMOs will be present on a similar research cruise of longer duration. MMOs will also be present on the seismic survey vessel at the Lunskoye field, and on all key vessels in the project area (e.g., dredges, pipe-laying vessels). All sightings of western gray whales will be recorded and included in a report.

7.5.4. Photo-Identification Surveys

Systematic photo-identification surveys of western gray whales present off Piltun Bay were sponsored fully or in part by SEIC during 1997, 1998, 1999, 2000, and 2001 (Würsig *et al.* 1999, 2000; Weller *et al.* 2000, 2001b, 2002b). Those surveys were in addition to brief photo-identification surveys conducted during 1994 and 1995 during independent research in the area (see Brownell *et al.* 1997; Weller *et al.* 1999). Based on the photo-ID studies, about 106 different western gray whales have been identified (Weller *et al.* 2002a).

In 2002, a Russian photo-identification team from IBM was trained and conducting surveys in both the Piltun and Offshore feeding areas, based on the research vessel *Nevelovsky*. A photo-identification lab was set up in Vladivostok after the end of the field season (mid October).

The multi-year photo-identification and re-identification surveys have provided information on the annual return and site fidelity of individual whales to the summer feeding ground from one year to the next, helped define the local distribution and movement patterns of whales, and has established the population size, survivorship, productivity, and reproductive intervals of the western population. In addition, the overall physical condition and health status of western gray whales summering off Piltun has been continuously monitored since 1997.

That information helps define the extent of the western gray whale feeding areas, and provides distribution and abundance information important in interpreting the potential effect of SEIC's operations on the whales, and the effectiveness of existing mitigation and protection programmes.

In 2003 and subsequent years, photo-identification surveys will be carried out using inflatable boats based on shore (Piltun feeding area only) and on a research vessel on a cruise of longer duration.

7.5.5 Western Gray Whale Prey Studies

Opportunistic research was conducted in 1998 and 1999 on food organisms found in fecal samples collected from actively feeding gray whales near Piltun Bay (Würsig *et al.* 1999).

Other benthic samples were collected in 1998, 1999, and 2000 near the Molikpaq drilling production platform (Continental Shelf Associates Inc. [cited in Würsig *et al.* 1999]; SEIC 2000), and in nearshore areas where whales were known to be feeding and areas whales were not feeding during 2000 (D. Weller, pers. comm., October 2001).

Part I of a western gray whale food study was initiated in 2000, with a contract to IBM to conduct a comprehensive review of literature and information on gray whale feeding areas in other parts of the Pacific and on the benthic environment in known gray whale feeding areas off Chukotka and on the northeast Sakhalin Shelf. That review (Kussakin *et al.* 2001) has been completed and provides a valuable overview on this topic for both the eastern and the western populations of gray whales, and is especially useful in outlining the extensive Russian literature on this subject.

Part II of the gray whale food study was a field-sampling programme conducted in 2001. The 2001 programme involved benthic sampling of invertebrate communities at fixed stations along 10 transects perpendicular to the shoreline, extending from shallow nearshore waters used by feeding western gray whales to offshore waters not typically used by feeding western gray whales. A more extensive western gray whale prey study is currently underway during 2002. The 2002 programme, conducted by IBM, involved sampling of sediment and benthic and epibenthic invertebrate communities in both the Piltun and Offshore feeding sites (1) at randomly selected stations along a fixed grid, and (2) opportunistically, where western gray whales are feeding. Areas not typically used by feeding western gray whales inshore of the Offshore feeding area, offshore of the Piltun area, and between the two feeding sites were also sampled. The goal of is to quantify the abundance and biomass of prey where whales feed in comparison to areas within and outside of the Piltun and Offshore feeding sites. That information may help to explain within- and between- season movements of western gray whales within their summer feeding range.

Knowledge of western gray whale feeding areas and why they are used is relevant to ongoing and planned exploration and production activities by SEIC and others. Furthermore, the food studies provide important information for mitigation and protection plans by defining main and possibly alternate western gray whale feeding areas and the subsequent need to establish mitigation measures if industry activities are planned in those areas.

In 2003 and subsequent years, western gray whale prey sampling will be carried out from a research vessel on a cruise of longer duration. Details of the survey design will be decided based on the results of the sampling conducted in 2002.

7.5.6 Acoustic Studies

Acoustic measurements were recorded in near shore waters near Piltun Bay during the summer of 1997 (Würsig *et al.* 1999) when seismic exploration was occurring in the P-A license area. Results indicated mean received levels (over 1 sec) of approximately 153 dB re 1 μPa in areas where gray whales were present when the seismic ship was 30-35 km away.

Underwater acoustics programmes were conducted in the P-A license area and near Piltun Bay during 1999 and 2000 to monitor industry-generated and ambient noise levels (Sobolevsky 2000, 2001). Those studies indicated that noise levels in the areas where

gray whales were present was generally less than 100 dB re 1 μPa rms, which is within the hearing range of gray whales, but below levels thought to cause physiological impacts to western gray whales and other baleen whales.

Additional acoustic studies were conducted in 2001 and 2002 to further document industry-generated noises emanating from the Molikpaq complex, with specific objectives to define noise attenuation, i.e. transmission loss at different distances from varying sources (production, tanker load-out, vessel activity). Acoustic measurements were carried out in different areas, including the western gray whale concentration area near Piltun Bay, and several other locations between Piltun and Molikpaq. The acoustic study in 2001 was conducted in conjunction with those commissioned by ENL as part of the monitoring programme associated with their seismic surveys near Piltun Bay.

Acoustic studies were conducted to determine both ambient and industry-related noise levels in the marine environment near industry activities (i.e., near the Molikpaq) and at locations where western gray whales are known to occur (offshore Piltun Bay). That information is important in helping SEIC evaluate and potentially adjust existing mitigation and protection measures for gray whales, such as helping define noisy activities that should be avoided when gray whales are present in adjacent feeding areas, helping define aircraft flight corridors, and determining avoidance distances for SEIC operations and vessels operating in the area. The information may also prove useful in helping to evaluate and mitigate potential noise impact during the design stage of future installations.

In 2003 and subsequent years, acoustic studies will be conducted to determine both ambient and construction-related noise levels in the marine environment near major construction activities and in western gray whale migration routes and feeding areas near those activities. Acoustic studies will also be carried out before the seismic survey begins to determine safety radii around the seismic survey vessel.

7.5.7 Tissue Sampling

Tissue samples were collected from western gray whales occupying the northeast Sakhalin shelf during 1998-2001. The sampling was not a specific task in the SEIC monitoring programme and was not sponsored by SEIC, but was conducted by SEIC contractors as part of other studies conducted under the auspices of the Area V environmental cooperation agreement between the United States and Russia (Weller *et al.* 2001). Nevertheless, some aspects of the tissue-sampling programme are relevant to the western gray whale and therefore are described here.

Tissue samples were collected primarily to supply mtDNA (mitochondrial DNA) used in genetics analyses of western gray whales (LeDuc *et al.* 2000), and to help to differentiate the eastern and western population. As a result of the study, the eastern and western gray whales are considered to be isolated populations (LeDuc *et al.* 2000). In addition to genetic comparisons, tissue samples could also be used to determine the level of toxicants in western gray whales, although to date they have not been used for that purpose. The study of pollutant "signatures" has proved beneficial in defining stock/population boundaries for some large whale species, and in some cases can be used to help determine the geographic area from which the toxins were likely to have been accumulated.

Tissue sampling is not planned for 2003 or subsequent years unless samples are required for autopsy purposes.

7.5.8 Behavioural Studies

Shore-based behavioural observations of western gray whales were conducted during 1997 and 1998 (Würsig *et al.* 1999, 2000). The 1997 observations were conducted before, during, and after the period when SEIC was conducting a seismic survey offshore, and the 1998 observations were conducted during the period before, during, and after the installation of the Molikpaq. The observations were conducted from the Piltun Lighthouse using a theodolite to determine precise locations, movement directions, swimming speeds, and a variety of behavioural characteristics exhibited by western gray whales in the Piltun area. Both the 1997 and 1998 studies suggested that the behaviour (surface-respiration-dive characteristics, orientation, and movement patterns) of western gray whales off Piltun Bay may have been influenced by industry activities and possibly other unmeasured factors (Würsig *et al.* 1999, 2000). Notwithstanding the changes in behaviour that were documented, the whales remained in the area off Piltun Bay during those two years (and most have returned to the area in subsequent years) (Würsig *et al.* 1999, 2000; Weller *et al.* 2000, 2001).

In 2002, scan sampling and theodolite-tracking observations were conducted from the Piltun lighthouse and adjacent stations on shore to ascertain baseline feeding and other types of behaviour, and behaviour potentially affected by anthropogenic activities.

The behavioural surveys are conducted to better understand patterns of western gray whale behaviour under normal and disturbed (e.g., in the presence of ongoing industrial activities) conditions. They are also conducted to obtain data to help develop and monitor the effectiveness of SEIC's mitigation/protection plans, which are directly related to the impacts of noise and other industry operations that could negatively affect western gray whales.

In 2003 and subsequent years, behavioural studies similar to those conducted in previous years will be carried out.

7.5.9 Integrated Research and Monitoring

Over the past five years, SEIC has supported a broad suite of monitoring studies to learn more about the western gray whales that spend the summer near the P-A license area. The studies generally have been conducted as distinct tasks, and results of each study have been presented separately as annual reports. Some reports (e.g., Würsig *et al.* 1999, 2000; Weller *et al.* 2000, 2001) incorporate information and results from previous years of study. To date, there has been no overall integration of the results of the various tasks and studies in order to give a broader view of the entire western gray whale studies and monitoring programme. Furthermore, it has been difficult when conducting studies of western gray whales to relate or correlate observed results of the various studies (especially the behaviour and distribution studies) with the many industry and other activities occurring on the northeast Sakhalin Shelf. In essence, the various studies have been multidisciplinary in nature, rather than interdisciplinary.

Future studies supported by SEIC (and ENL) will be designed as much as possible so that results of one study may be useful in interpreting results of other related studies. Information about industry activities, e.g., the timing, duration, location, and activities associated with drilling programmes, seismic surveys, sub-bottom profiling, tanker load-outs, and construction activities will be made available to scientists conducting studies on

the western gray whales. Researchers will then be able to integrate results and discussions of their reports with those from other tasks and activities being conducted in the western gray whale monitoring programme.

7.5.10 Future Studies: 2003 and Beyond

SEIC is committed to continue western gray whale monitoring into the future and for as long as its operations could potentially have an impact on gray whales. Detailed plans have not yet been made for studies to be conducted in 2003-2004, but a general description and level of effort is given in the preceding sections. It is anticipated that all studies conducted in 2002 will be continued with possible modifications based on 2002 results. It will be important to begin studies earlier in the year; 2002 studies were delayed for numerous logistical and administrative reasons, but experience gained in 2002 should facilitate the mobilisation process in 2003. In particular, aerial surveys should begin in May to document migration into the Piltun area, probably past the Lunskoye area. Scopes of work will be prepared early in 2003 as part of the work currently funded by SEIC.

Recent concerns about the health, condition, and productivity of western gray whales suggests that some factor(s) is (are) affecting the condition of the whales, either when they are on their summering grounds, during migration, or on their presently unknown wintering grounds (see Brownell and Weller 2001). Also, because the western gray whale population may only be about 100 individuals, with plausibly only 50 reproductive adults (Hilton-Taylor 2000, Weller and Brownell 2000), it has become considerably more important to define migration routes, wintering areas, and regional movement patterns. For those reasons, SEIC will support a satellite telemetry study of western gray whales as part of future monitoring studies off northeast Sakhalin Island. Those studies were originally scheduled to be conducted in 2001, but a recommendation by the International Whaling Commission indicated that the study would be best deferred at least until tagging procedures are first tested on eastern gray whales.

7.6 Managing the Impacts

7.6.1 Overview of Mechanisms for Implementation of the Findings of this EIA

This EIA is the latest in a large series of studies and monitoring programmes on western grey whales, and much of its baseline information, findings, and recommendations are derived from the earlier work. It should be noted that EIA is a process and this report is, therefore, a snapshot reflecting the current status of the design and execution planning. One of its key objectives is to identify issues that need to be addressed further, either during the Detailed Design phase, or through ongoing management.

The main mechanism of implementation of recommendations from this EIA is the Health Safety Environment Management System (HSE MS) described in Chapter 1 of this EIA. The specific findings and recommendations derived from this EIA, and the resultant actions will be captured and integrated into the SEIC HSE MS *via* three principle formal mechanisms:

- SEIC corporate HSE management system and HSE plans;
- asset-specific HSE management systems and HSE plans; and
- key issue-specific plans for SEIC as a whole.

7.6.2 SEIC HSE MS and HSE Plans

The SEIC HSE MS contains all of the elements traditionally associated with Environmental Management Systems and, as such, no specific stand-alone-company wide EMS is warranted. The SEIC HSE MS is discussed in more detail in Chapter 1.

With respect to implementation of the EIA findings, key features of the HSE MS include

- a clear structure for delineation of HSE responsibilities;
- an identification and ongoing tracking process for HSE issues;
- a formal planning process for management of such issues;
- an internal monitoring, reporting and review cycle; and
- an external verification and auditing process.

The management of HSE in SEIC is integrated into the SEIC Corporate Management System and, as such, is based on the principle of asset-based management overseen by a corporate centre. That includes the Phase 2 assets that are in the development and construction stage.

Accordingly, the key HSE management plans and commitments are set out in the same structure and summarised in the following formal documents:

- SEIC HSE plans; and
- asset HSE plans.

Those plans are living documents and will be subject to annual updates.

7.6.3 Key Issue-specific Plans

The management of the identified key environmental issues is included in the scope of the SEIC HSE MS. Implementation of appropriate mitigation, monitoring, and management measures will be carried out by the individual SEIC assets and overseen by the corporate centre.

Some key environmental issues, however, will have impacts across a number of assets, and are identified as being of critical importance to SEIC as a whole. Each of those issues is being tracked and managed at a corporate level, and they are the subjects of dedicated management efforts and plans. Of those key-issue specific plans, the two most relevant to the implementation of measures for the protection of the western grey whales, as defined in this EIA, are:

- The Western Gray Whale Protection Programme; and
- The Oil Spill Response Plan.

7.6.3.1 Western Gray Whales Protection Programme

SEIC has addressed the protection of the western gray whales through a series of studies and monitoring programmes. The findings and experiences from this work have been compiled into a Western Gray Whale Protection Programme (WGWPP). This latter programme defines a series of specific actions, mitigation measures, and monitoring

activities designed to minimise disturbance of western gray whales by the project. It is, therefore, a key management tool for the implementation of mitigation measures defined in this EIA and earlier studies.

At the time of preparation of this EIA, the existing WGWPP covers SEIC's operational activities under Phase 1. The findings of this EIA will be used to extend the WGWPP to incorporate both Phase 1 and 2 activities. Annual updates, based on new findings, experiences, and recommendations, will follow.

7.6.3.2 Oil Spill Response Plan

The issue of oil spills is a risk for all oil and gas projects. The natural hazards and environmental sensitivities that exist for the Sakhalin II Project focus attention on the potential for impacts. Design-for-Safety is the most fundamental tool in minimising the risk of spills. Prevention is, therefore, the first and foremost mitigation measure, and that will include the development of SCADA leak detection and emergency shut off systems and robust pipeline design. The response mechanisms, i.e. the Oil Spill Response Plans and OSR equipment, will provide the last line of defence.

SEIC has completed preliminary Oil Spill Response Plans for all future assets. The plans state the expected scale, type, and location of OSR resources to be developed on Sakhalin. The formal plans will be updated and finalised at least six months before operations. The associated resources will be in place, personnel trained, and equipment and procedures tested before operations. Construction-phase spills will be addressed by specific dedicated prevention measures and contingencies in the EPC contractors' HSE plans and procedures.

7.6.4 External Reporting of the EIA Implementation Process

External reporting of SEIC's HSE performance and plans is part of its commitment to public and stakeholder consultation. Public feedback on the EIA and the associated implementation plans will form part of that consultation process.

Specifically, with respect to this EIA, an overview of all of the environment-specific work and highlights of future progress in the assessment and management of the key issues and activities will be succinctly summarised and externally reported by SEIC in the annual SEIC HSE Report.