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1 INTRODUCTION

This supplementary Environmental Statement (ES) provides a summary of the consultation on the *Lunskoye Seismic Survey 2003 ES*. The *Lunskoye Seismic Survey 2003 ES* reported the findings of an Environmental Impact Assessment (EIA) conducted for the Lunskoye Seismic Survey and was prepared by Environmental Resources Management (ERM) and LGL Ltd in March 2003. The survey is planned for July until September of 2003, and is to provide additional geological information to aid the development of the Lunskoye offshore oil and gas field on the north-east coast of Sakhalin Island, far-east Russia. The field will be developed as part of Sakhalin Energy Investment Company Ltd's (SEIC) Sakhalin II Project.

This report:

- provides details of the consultations and lists the organisations that have been consulted;
- presents and addresses consultee comments and queries;
- provides supplementary information;
- outlines additional mitigation measures as a result of the consultation process; and
- presents additional monitoring information from the 2002 and 2003 marine mammal monitoring programme.

The structure of the remainder of this report is outlined below.

- ***Section 2: Consultee Responses*** provides a list of consultees and presents their comments, together with the responses of SEIC, ERM and LGL in table format.

- ***Section 3: Supplementary Data and Additional Mitigation Measures*** presents information on additional measures that will be introduced to further mitigate the potential environmental impacts of the seismic survey.

- ***Section 4: Marine Mammal Monitoring Surveys*** presents over-flight data from the 2002 and 2003 marine mammal surveys (not available at the time of issue for the *Lunskoye Seismic Survey ES*).

- ***Section 5: Conclusions*** summarises the information and conclusions of this supplementary report.

- ***Section 6: Abbreviations*** includes a list of abbreviation used in the document.

- ***Section 7: References*** provides a reference list of additional literature cited in this report.

2 CONSULTEE RESPONSES

2.1 PUBLIC CONSULTATION PROCESS

Copies of the ES have been provided to several Sakhalin Island scientific and research institutes (*eg* SakhNIRO and Sakhalinrybvod), to the Sakhalin Fishery Association, to international and non-government organisations (NGOs), including WWF, Sakhalin Environment Watch (SEW) and Russian Geographical Society. Russian Far East, Sakhalin Island and various international NGOs were informed of the availability of the English and Russian versions of the ES being available on the SEIC website via email. A reminder was subsequently sent as the closing date approached.

Sakhalin Energy have stated that they are grateful to the authorities, institutes, non-governmental organisations and public on Sakhalin Island for their efforts to review and comment on the Lunskoye Seismic Environmental Statement.

An overview of consultees is included in *Table 1* below. All comments and the responses of Sakhalin Energy, ERM and LGL are shown in *Table 2*.

Table 1 Consultees

Consultee	***Comments***
District libraries: • Dolinsk • Korsakov • Nevelsk • Nogliki • Poronaisk • Smirnykh • Tymovsk • Uglegorsk • Kholmsk • Aniva • Makarov • Tomari • Okha • Aleksandrovsk-Sakhalinsky	*Comments received (predominantly in oral form), written comments from the district library of Tomari*
City library in Yuzhno	*No comments*
Sakhalin Regional Universal Scientific library in Yuzhno	*No comments*
Russian Governmental Institutes	*Comments received from:* • *SakhNIRO* • *Sakhalinrybvod* *No comments received from:* • *VNIRO*
NGOs	*Comments received from:* • *Sakhalin Environment Watch (SEW)* • *Russian Geographical Society (RGS)* *No comments received from:* • *Wild Salmon Center*

Table 2 Consultee Comments and Responses

Organisation and Date of Response	*Comment*	*Response*
Russian Governmental Institutes		
SakhNIRO 27-2-2003	Section 4.8. - In this Section the authors tried to provide data on basic communities of marine hydrobiota of the shelf zone of the Sea of Okhotsk in area of the northeastern Sakhalin Island. Probably because the representatives of organizations that located far from Sakhalin Island were engaged in preparation of the Report, the Sea of Okhotsk turned out to be communicating with the Arctic Ocean instead of the Pacific Ocean. (Note that this is because of a wrong translation of the term 'North Pacific' in Russian version of the Report)	Information on the benthic communities was obtained from studies current out of the area, including those carried out by SakhNIRO.
SakhNIRO 27-2-2003	As a general comment should be mentioned a superficial and primitive description of life forms, misuse of terms and misspelling of Latin names of species what on the whole witnesses on non-professional preparation of the Section.	It is accepted that minor errors in translation can occur in any study. The issue of importance for EIA is whether these affect the assessment of environmental impacts. We do not consider that in this case it does.
SakhNIRO 27-2-2003	Section 4.8.1. In the Report are missing the main indices that characterize phytoplankton community in the area under study. There are not indicated the total amount of species, species representation in separate taxonomic groups, dominating species and species structure, distribution of population and biomass of phytoplankton per square unit or volume for water area and versus depth, seasonal variability of parameters in summer period. Without such background descriptions it is impossible to assess the condition and quantitatively evaluate the impact onto phytoplankton community during seismic surveys. With all this, in references are given only two sources of information – NOAA, 2002 and Komex 2002, which are taken from web sites in Internet and are not directly related to anticipated area of seismic surveys. The use of term "population" in the given description is wrongful. Distinguishing the increased values of phytoplankton biomass in area of Kamchatka Peninsula, it should be noted that in area of the eastern shelf of Sakhalin in spring-summer period are also observed significant concentrations of phytoplankton, timed to upwelling zones, in particular, to East-Sakhalin upwelling zone.	It is acknowledged that this section could have been improved by presenting more data specific to the field. The section was researched and written based upon sources of information available at the time of issue, including information reported in the Sakhalin II Project TEOC submission EIA and the results of the two internationally recognised Sea of Okhotsk research programmes referenced within the section (NOAA, 2002 and Komex, 2002). Responses of plankton and phytoplankton to seismic surveys are not well documented. Under laboratory conditions, for example in experiments carried out by Kostyuchenko (1971) and Dalen and Knutsen (1986), there were no significant differences in mortalities between control and experimental groups. In one study, Kostyuchenko found that a 1.4 x 10^4 kPa (142.7 kg/cm^2, compared with an estimate of 140 kg/cm^2 for the Lunskoye seismic survey) discharge by an airgun caused damage to fish eggs within a 5-metre radius. Experiments on fry showed temporary balance problems resulted from exposure, but these effects were temporary, lasting only a few minutes, after which full recovery was observed. The possibility of non-lethal pathological effects in larvae (such as damage to hearing apparatus) was not excluded by these studies, but given experimental limits, could not be investigated further.

		On a larger scale, the extent of seismic effects will be a function of the density of the plankton and phytoplankton assemblages that are exposed to the airguns. As recognised above, little is known about the abundance and varieties of plankton and phytoplankton present within the survey area. However, any localised concentrations of eggs and larvae will generally be transient, both in duration and extent, being rapidly dispersed by shelf currents. If a lethal exposure distance of 5 metres (McCauley 1994, after Kostuchenko 1971) is adopted as mentioned above, only a very small proportion of any plankton or phytoplankton in the survey area would be affected by the airguns. The potential impacts on plankton and phytoplankton have therefore been assessed and reported within the ES as being minor. Additional information regarding the species present within the Lunskoye Field would not be predicted to change this assessment in any way. The information in the EIA is therefore considered to be sufficient to base a judgement on.
SakhNIRO 27-2-2003	Zooplankton -In the Report are indicated the dominating species Pseudocalanus minutus, Oithona similis, Metridia ohkotensis, M. pacifica, Neocalanus cristatus, Neocalanus plumchrus, C. glacialis, Thysanoessa raschii, Th. longipes, Th. inermis, Euphasia pacifica. The total annual zooplankton production from the Sea of Okhotsk reaches 3 x 10^9 million tons. The listed species of zooplankton are the most mass types both of the shelf and open part of the Sea of Okhotsk. Lunskoye field is located in water area with sea depths of 30-35 m, so in this area will prevail coastal and over-shelf zooplankton communities, with domination of neritic species, such as Pseudocalanus newmani, Oithona similis, Centropages abdominalis, Acartia lingiremis, A. hudsonica, pelagic-benthic forms of Cumaceans and Amphipods. The above said mass species occur in smaller amounts. Also are missing the basic quantitative indices - population and biomass per unit of volume, frequency of occurrence and indices of abundance of zooplankton species, which are the main contributors in forming of biomass of the second and third trophic levels. There are missing data on seasonal variability of parameters and spatial distribution. To microplankton refer plankton organisms 50 to 1000 μm in size. Organisms, to which in most cases refer the most mass species of zooplankton, are treated as mezozooplankton 1000 to 5000 μm in size. The larger forms are macroplankton. The presented volume of information and data source – NOAA, 2000, are obviously insufficient, since they do not allow to describe baseline conditions of	It is acknowledged that this section could have been improved by presenting more data, and the additional information provided by SakhNIRO is acknowledged. In terms of impact assessment, however, the EIA predicts that impacts on the zooplankton community will be minor. The information in the ES is therefore considered to be sufficient to base a judgement on.

	zooplankton community in the area of works and assess level of impact of planned seismic surveys	
SakhNIRO 27-2-2003	Ichthyoplankton in the area under study is described as a component of zooplankton. It is noted that the most abundant are fish roe and/or larva of the following fish species: navaga, starry flounder, Berg's bullhead, herring and smelt. The results of 2002 studies showed that Lunskoye Field borders an area of high concentrations of ichthyoplankton. No references to sources of information. Composition of ichthyoplankton in area of Lunskoye field has much greater diversity than that given in description. In addition to the listed species, in catches of macroplankton nets also are found fish roe and larva of sand-eel, long blackfin flounder, flathead sole, narrow-dent flathead sole, Nadezhny spiny flounder, Asian smelt, snailfish. In terms of population directly in area of Lunskoye field dominates larva of (Pacific) capelin. In water area from Lunsky Bay to Cape of Gvozdev were also found accumulations of larva of walleye pollock, which are the most significant for the northeastern part of Sakhalin shelf. It is needed to provide in ES more detailed description of ichthyoplankton complex with inclusion of quantitative data, published and archive materials of SakhNIRO. The presented volume of information does not allow to assess impact of planned seismic surveys onto ichthyoplankton.	It is acknowledged that this section could have been improved by presenting more data and the additional information provided by SakhNIRO is acknowledged. As stated above, the impacts on plankton are predicted to be minor and therefore the information in the ES is considered sufficient to base a judgement on.
SakhNIRO 27-2-2003	4.8.2. Benthos sampling within the Lunskoye field has identified 183 species of marine microzoobenthos from 18 faunal groups. The diversity of species is found to be highest among the Polychaeta, then follow amphipods with 56 species and bivalves with 16 species. Inaccuracy in term usage is noted. The title of Item does not correspond to contents – description of communities is not found. By analogy with the previous titles it is needed to change the title for "Benthos". Microzoobenthos are organisms < 0.5 mm in size. In dredged benthos are present mostly meio- and macrobenthos (larger that 0.5 mm), among which the main role play moving organisms that live freely on sea bottom (vagil benthos) and infauna – organisms that live in seabed soil or crawl on its surface. This is defined by the character of seabed soil – on sea depths up to 100 m prevail sand soils. Sublittoral abreast of Lunsky Bay is marked out as an area with the highest density of organisms per unit of area – up to 98040 organisms per square meter. The main role here play cumaceans (Diastylis bidentata). Regretfully, in description of benthic community also are missing quantitative characteristics, and dominating species that are the main contributors in forming a total biomass are not marked out. At the end of description a source of information is	Marine invertebrates, and particularly crustaceans, do not have elaborate organs for the detection of sound, but rely instead upon mechanoreceptors to detect water-borne vibrations. Additionally, most invertebrates do not possess air-filled spaces within their body cavities (with the exception of cephalopods such as squid), so their sensitivity to sound is much reduced. Squid and cuttlefish do not possess significant air spaces and are highly mobile, so they are able to avoid sources of disturbance. Limited published information about the effects of underwater anthropogenic sounds on marine invertebrates is available. The most relevant of these to the effects of seismic surveys involved the detonation of several hundred kilograms of explosive within 15 m^2 of caged shrimp (Gowanloch and McDougall, 1944). The shrimp survived the experiment unharmed. A similar experiment conducted by the South African CSIR exposed the burrowing shrimp *Upogebia capensis* to underwater blasting at distances from 0.5 m to 120 m, with no mortalities. No estimates of the intensity of sound produced by the explosions in these two studies were given, but it can be assumed that they were several orders of magnitude greater than those generated by an airgun array. The potential impacts on invertebrate species have therefore been assessed and reported within the ES as being minor, as it is not predicted that any significant impacts will occur as a result of seismic acquisition.

	given, but it is missing in the List of Literature of TEO, Vol. 7 Book 1- EIA. The presented volume of information is insufficient for the background description and quantitative assessment of impact of planned seismic surveys onto benthic community.	The suggestion to change the title from 'Benthic Communities' is not accepted. The term 'benthos' is used to describe organisms that live on or in the seabed, and is correctly used within the ES.
SakhNIRO 27-2-2003	4.8.3-The data are provided that on the northeastern shelf of Sakhalin were recorded some 101 species of fish, and in the Lunskoye Field – 23 species of fish from 12 different families. Species are both migratory and non-migratory. Among them are marked out both anadromous fishes – salmon, and species that migrate within the Sea of Okhotsk, e.g. walleye pollock. Similarly to other Items, the title does not reflect the presented contents. No references to sources of information. In the given description is significantly reduced the total number of ichthyofauna species. During the survey carried out by SakhNIRO in October 2002 in the said area were recorded 111 species of fish, and it is not yet a full list. In the first place it is related with the fact that fishes can migrate along entire shelf area, keeping to certain depths and certain temperature optimum. In the Report are absolutely missing the data on entering of salmon fishes to rivers of eastern Sakhalin, though by mid of summer the number of salmon spawners in 2003 may exceed 10.57 mln. fishes. The maximum catches are usually recorded at the end of July and in the first decade of August. The major mass of salmon goes to more northern areas (Nyisky Bay), but periodically humpback salmon is caught in more southern area near rivers Melkaya, Bogataya, Nerpich'ya. It is needed to amend ichthyocene description with species of fishes that reproduce and migrate in area of planned works. The detailed description is given only in Section 4.12.4 for walleye pollock and humpback salmon (in the text the reference is erroneously made to Section 4.11.4). Despite of absence of commercial concentrations of walleye pollock in area of Lunskoye field, there are observed significant concentrations of found fish roe and larva up to the end of September. As for the salmon fishes, and humpback salmon in particular, seismic works can change direction of anadromic migrations and result in re-distribution of spawners in spawning grounds. It is possible with mass entry of massive fish shoals and their move along eastern coast of Sakhalin. The presented volume of information is insufficient to describe background conditions and assess impact of pneumatic seismic energy sources on ichthyofauna of the area. In the Report is missing the description of commercial species of invertebrates.	The sensitivities of fish species to seismic survey noise depend upon various anatomical and physiological differences. Fish can therefore be placed in three categories of sensitivity: high, medium and low. High sensitivity species, otherwise known as 'hearing specialists', typically have a form of coupling between the fish's swimbladder and the inner ear. In catfish, for example, a chain of bones, known as Weberian ossicles make this connection. Species possessing this feature are known as 'otophysans'. Non-otophysan hearing specialists also occur and have a variety of hearing adaptations, for example anterior processes on the swimbladder that bring it into close contact with the inner ear, as in the herring (*Clupea harengus*) which has a gas duct which connects the swim bladder directly to the inner ear, and sea breams (Sparids). Hearing specialists are characterised by high auditory sensitivity and bandwidth. Many species of fish possess a swimbladder, but lack the special connections to the inner ear, including the cod (*Gadus morhua*), groupers (*Epinehelus spp.*) and salmon species. Salmon species have a primitive form of swim bladder, and are considered to be relatively unreactive to sources of sound. The sensitivity of these species can be considered to be medium, and bandwidth tends to be narrow. The majority of teleosts ('bony' fishes), with no known hearing specialisms are usually included in this category. Fish lacking a swimbladder are relatively insensitive to sound. Species such as sharks, skates, rays, flatfish and many of the scombrid fish such as mackerel and tunas can be included in this low sensitivity category. Sensitivities based on experimental data prepared by Fay (1988) show the following hearing threshold values. • High sensitivity: < 80 dB re 1μPa (average = 60 dB re 1μPa) • Medium sensitivity: 80 – 100 dB re 1μPa (average = 90 dB re 1μPa) • Low sensitivity: >100 dB re 1μPa (average = 110 dB re 1μPa) These threshold values are based on a continuous source of sound. Thresholds for short pulses of sound, typical of seismic surveys, are higher than those for

		continuous sounds, and so the thresholds stated above can be considered to be worst-case or precautionary values. A second factor is the background noise level; as background noise increases, the hearing threshold rises. The required signal-to-noise ratio has been investigated for various species and is of the order of 15-25 dB for frequencies in the airgun emission range (Fay, 1988). Finally, it should be noted that the fact fish can detect the noise does not necessarily mean that they will react to it, or are harmed by it. Behavioural changes in fish have been observed at sound levels of approximately 180 dB re 1μPa-m, and have been demonstrated to increase with increasing sound intensity. Studies have also demonstrated the ability of fish to acclimatise to airgun noise with time (Chapman and Hawkins, 1969). Sound levels from seismic acquisition are generally lower than those where major behavioural changes would be expected. There is no documented instance of noise generated from seismic acquisition causing significant impacts to marine fish. In 1998, scientists from the Fisheries Research Services Marine Laboratory in the UK conducted an experiment whereby underwater TV cameras were used to monitor the behaviour of fish around an inshore reef to airgun noise. The researchers found that the fish displayed a brief, voluntary reaction (compared, in neurological terms, to the blink of a human eye-lid). When the stimulus ceased, the fish resumed their activities, with their intended track apparently unaltered. The long-term, day-to-night movements of shoals were also uninterrupted by low-frequency pulses projected into their path (UKOOA, 1999). Fish injuries resulting from airgun operation are unusual. No damage is evident below 220 dB re 1 μPa for juvenile and adult fish, and for eggs and a fish larva, damage is reported at around 217 dB (Turnpenny and Nedwell, 1994). The risk of injury to juvenile and adult fish in open water is considered to be minimal, due to their mobility. Studies have shown that there were no fish mortalities associated with either the firing of a single 300 in^3 (4,900 cm^3) airgun (Falk and Lawrence, 1973) or a 240 in^3 (3,933 cm^3) array of nine airguns (Weinhold and Weaver, 1972). Pearson *et al* (1992) exposed caged rockfish (*Sebastes spp*.) to the firing of a single airgun, and recorded a variety of behaviours ranging from an increase in general activity to alarm responses. The behavioural changes became particularly noticeable at around 180

		dB re 1 μPa, and increased with increasing sound intensity. This study also demonstrated the ability of fish to acclimatise to airgun noise with time. Sublethal effects of exposure to high-level noise, have, nonetheless, been demonstrated. Enger (1981) and Cox *et al* (1987) showed that, with prolonged and continuous exposure to high intensity sound, the hearing apparatus of fishes could be damaged. However, the continuous exposure scenario is not comparable to that experienced by fish during seismic surveys, owing to the avoidance behaviour demonstrated by fishes and the transient nature (both special and temporal) of the seismic pulses. It is therefore not anticipated that there will be any significant effects resulting from the Lunskoye seismic survey. Most fish are capable of rapid and sustained locomotion, which will enable them to take avoidance action as the survey vessel approaches. Soft start / ramp up measures will also provide sufficient time for fishes to avoid the area immediate to the vessel and airgun array. The impact of the survey on fish species, whether they have high, medium or low sensitivity, will therefore be minor. It should also be noted, with the specific reference to salmon and the dependence of Sakhalin communities upon them and other fishery, that no major salmon rivers have been identified as having outfalls in the vicinity of the Lunskoye Field, and no evidence exists to imply that the area is frequented by salmon, or provides specific or unique habitat or feeding / maturation grounds for them. Salmon generally migrate in the near coastal zone, and would not be expected to be present in large numbers within the field. If they were present, as described above, significant impacts would not be predicted to occur due to the low sensitivity of salmon to acoustic noise. Any effects would therefore be predicted to be minor, transient and localised. As stated in the sections above, there is no evidence that fishing activity occurs within the field. The ES predicts that impacts on the fish community will be minor. Additional information on the specific species of fish present within the Lunskoye Field would not change the assessment since minor impacts are predicted irrespective of the acoustic sensitivity of the different fish species. The information in the ES is therefore considered to be sufficient to base a judgement on.
SakhNIRO 27-2-2003	In Sections 4.9–4.10 is provided the background information on the status, species composition, distribution and seasonal dynamics of marine mammals in coastal waters of Sakhalin Island and Sea of Okhotsk, and in particular, in the vicinity of the Lunskoye Field. These Sections are described in more details than	Comment is noted. The ES has been sent out to various centres of expertise, as well as national and international NGOs active in the field of environmental protection. Feedback received from all these organisations has been seriously taken into consideration. Moreover, the ES was developed on the basis of information from

	the previous ones, and, in SakhNIRO's viewpoint, are sufficient for EIA. However, since in SakhNIRO's structure no relevant specialists and laboratories are available, then the conclusion on these Sections, as well as on Section 4.11, should be possibly obtained from the Sakhalin Region Natural Resources Committee of MNR of Russia.	numerous national and international institutions with expertise in the field of marine mammals, and in particular in the Sakhalin region. All together, we believe that the assessment of impacts of marine mammals has been very thorough.
SakhNIRO 27-2-2003	Section 4.12: The Sub-Section that describes commercial fishing is placed into social section, which seems to be not quite justified, since the content does not characterize the type of economic activity and its social significance, but describes species of commercial fishes, invertebrates and algae. These descriptions should be moved, after corresponding editing, into Sub-Section on fish communities, and the Section in itself needs to be revised in social and economic aspect with involvement of data directly for the northeastern Sakhalin.	Since impacts on fish and fisheries are predicted to be minor, associated socio-economic impacts would also be minor.
SakhNIRO 27-2-2003	4.12.4. The Sub-Section, likewise the previous descriptions of marine life, is prepared in a non-professional manner, because the entire series of mistakes are made – the references of species to families are incorrect, the listed objects are not found within water area of the northeastern Sakhalin, the ecology of walleye pollack is characterized wrongfully, etc. Distribution of commercial species shown on Fig. 14 is absolutely non-informative – there is no distribution of density (biomass) values for water area for the main commercial species or groups. Comments on walleye pollack and salmon are given in Section "Fish Communities". The scope of materials is insufficient for background description of commercial fishing and potential impact on fishing activities.	Information for the section was based on that presented in the Sakhalin II Project TEOC submission EIA. Russian consultants, drawing upon reports and studies by SakhNIRO and others, carried out research for this EIA. Whilst errors in translation are accepted, we are unclear on the details of the criticisms. As stated above, impacts on fish are predicted to be minor due to the effect of sound sources on fish and their responses to it.
SakhNIRO 27-2-2003	Despite the fact that in the Sea of Okhotsk there are much more species of brown and red algae with commercial value than indicated in the Report, there are no commercial resources of algae in area of Lunskoye Field, since the sea bottom sediments are represented by sands of different coarseness, on which adnate species can not develop. Consequently, no marine algae is collected and cultivated in this area.	Comment is noted. *Section 4.12.6* states that there is no evidence of any algae collection or cultivation activities within the Lunskoye Field.
SakhNIRO 27-2-2003	5.2.3. The impact is assessed by three quantitative and rather conventional categories – minor, moderate and significant. Substantiations of selection of categories are not comprehensive and dependable on subjective opinion of experts.	*Section 5.2.3* of the ES presents a comprehensive categorisation of impact levels. The EIA follows established international practice in this respect. In all predictive studies, there is, however, always a certain level of judgment required.
SakhNIRO 27-2-2003	5.2.4. General comment to EIA methodology: In accordance with the existing normative and methodological documents at the stage of designing of works in water areas of water pools that have fishery significance the non-preventable	The EIA was carried out using a methodology to meet international EIA standards rather than Russian Federation standards. In accordance with RF regulations, however, a separate report on fish damage calculations has been prepared by SEIC.

	damage to water biological resources should be quantitatively assessed. The calculation of damage to fishery reserves and implementation of compensatory measures has a preventive nature. According to multiple observations and studies, seismic survey works, likewise other types of economic activities, may cause certain changes in functioning of natural populations, species and entire communities. Such impact is quantitatively assessed based on experimental data for fish roe and larva, zooplankton and some benthic organisms, which are a nutritive base for fish. In presented version of EIA the methodology of assessment of potential damage to fish reserves is missing.	
SakhNIRO 27-2-2003	Section 5.3. -The entire Section, except for the last two sub-sections, is well prepared and does not require any comments. We mark out a good review of literature sources and account of all aspects of the results of studies of marine mammals of the northeastern Sakhalin for assessment of potential impact of seismic survey works.	Comment is noted.
SakhNIRO 27-2-2003	The Sub-Section is incorrectly included into a Section that refers to mammals. Sub-Sections 5.3.12 and 5.3.13 should be turned into individual sections.	Comment is noted.
SakhNIRO 27-2-2003	Impacts on Fish - Descriptions of fish communities, though not in full, already contains the proof of ichthyofauna presence in water area of Lunskoye Field. At present we can assert about local direct impact that results in functional damages and death of plankton and some benthic forms of invertebrates, fish roe and larva within the safe radius, as well as about change of migration routes of marine mammals and fishes. Great concerns raise observations and published data on decrease of fish catches of commercial invertebrates and fishes in areas of seismic survey works, dissipation of accumulations of fishery objects. And the question on how sustainable and reversible are the changes in structure of accumulations, areas and duration of growing period of marine mammals is still open. The experimental studies of pressure effects onto zooplankton, in addition to consequences mentioned in ES, showed the increase of safe radius foe younger larvae stages of invertebrates and mature female species. Despite of sufficiency of data provided in the ES and available in published sources (Samatov, Nemchinova, 2000) for quantitative assessment of impact of seismic survey works on marine biological resources, the calculation of damage to fish reserves caused by degradation of feeding conditions due to partial loss	As assessed in the ES and discussed in the sections above, the impacts on the fish community are considered transient, minor and reversible. It is acknowledged that as such, the project may temporarily reduce fish stocks in the survey area, since fish may swim away from the area. However, recent information collected by SEIC (provided by Sakhalin Fishery Association) demonstrates that there are no fishing activities noteworthy in the area. Nevertheless, it is noted that a separate study on fishery impacts has been presented in the report on Fish Damage Calculations.

	of nutritive base is not made	
SakhNIRO 27-2-2003	Section 5.4. Besides the said measures on reduction of impacts on fishery activities should be added commitments on compensatory measures related to reproduction of fishes in volumes defined in calculation of damage to fishery reserves.	A separate report on fish damage calculations has been prepared by SEIC.
SakhNIRO 27-2-2003	Section 5.5. With failure-free mode of operation of seismic vessel and with due account of all requirements stated in ES we can agree with environmental impact assessment as "minor" and not requiring quantitative calculations.	Comment is noted.
SakhNIRO 27-2-2003	Section 7.3. Description of monitoring programmes and mitigation measures to reduce impact on water biological resources does not provide for identification of impact of seismic survey on behaviour and conditions of fishes and other kinds of marine life. For the Sea of Okhotsk the field data on assessment of impact of seismic survey on zooplankton, fish roe and larva of commercial fish species as well as on benthos, in view of small sea depths (25 m), are insufficient.	As discussed in the sections above, the impact on zooplankton, fish roe and larvae of commercial fish species as well as benthos was assessed to be minor. SEIC does not consider that a monitoring programme would be justified.
SakhNIRO 27-2-2003	FGUP SakhNIRO finds it necessary to envisage in seismic survey planning that in 2003 is expected a large run of salmon – up to 10.57 mln. humpback salmon spawners – to the northeastern Sakhalin. The most mass runs are expected in the second half of July-August. The main growing period of Western (gray) whales in area of Piltun Bay and Chaivo Bay, based on the results of surveys in 1988, 1990, 1991, 1994, falls on July-August, also smaller accumulations are observed in more southern part of the shelf south-eastward of Chaivo Bay. The surveys conducted in 2000, 2001, which included aerial surveys of a large offshore part of the northeastern Sakhalin, showed that distribution and time of presence of gray whales in waters of the northeastern Sakhalin during seasonal migrations are much wider. The migrating whales were observed in May-1st half of June in area of Lunsky Bay and Chaivo Bay. In view of salmon fishing season and migrations of gray whales the time period for seismic survey is recommended to be moved to the first half of summer – from the second half of June till the second decade of July.	The survey has been scheduled to minimise potential impacts on the Critically Endangered western gray whale. Impacts on fish resources were assessed to be minor and reversible (see discussions in sections above). The survey duration will be up to 2 months, and consequently it is not possible to change the timing of the survey to fit both the salmon and whale concerns. Changing the timing to reduce potential impacts on salmon and potentially increase impacts to western gray whales is not, therefore, justified.
Sakhalinrybvod 27-2-2003	Pursuant to the Federal Law No. 7 *On Environmental Protection* of January 10, 2002 (namely Chapter VI, Article 32, Item 1) Environmental impact assessment shall be made in respect of projected economic or other activities capable of having direct or indirect environmental impact, irrespective of organizational and property forms of subjects of the economic or other activities. As far as seismic survey (including that with the application of compressed air sources) renders certain negative impact on water biological resources, development of ES as part of seismic design should be mandatory.	As a company principle, SEIC is committed to undertake environmental impact assessment studies of all its activities with potential environmental impacts. As such, SEIC has conducted a detailed environmental impact assessment of its planned seismic survey in the Lunskoye area.

Sakhalinrybvod 27-2-2003	Seismic EIA materials schedule oily effluent (of 15 ppm after treatment) and residual chlorine (of 1 ppm after water treatment and effluent chlorination) to be discharged from seismic and supply vessels. As far as the vessel operation is scheduled within the RF territorial sea, the discharge of oily effluent and residual chlorine should be prohibited in accordance with the requirements of the National Regulations for Protection of Inshore Sea Waters of 1984.	In consideration of this comment, the specifications for the operation of the survey will be changed. The survey vessel will have a bilge water tank and will not discharge any water containing oily effluent or residual chlorine into RF waters.
Sakhalinrybvod 27-2-2003	Nowadays seismic practice worldwide utilises harmless filling for the seismic streamers, therefore the use of kerosene, as a filling for the seismic streamers should be avoided at Lunskoye field.	In consideration of this comment, the specifications for the operation of the survey will be changed. The contractor will be using the synthetic filler Isopar M® (see *Section 3.2.1*).
Sakhalinrybvod 27-2-2003	The Seismic Survey ES contains extensive information about marine mammals and estimated impact of CAS on them. There are several references to the aerial survey of Lunskoye field conducted in 2002 across the entire ES, but no outcomes of such survey provided. The ES includes numerous quotations from international sources on arrangement of marine mammals monitoring in the process of seismic operations and data on establishment of safe protective zones for different marine mammals depending on the applicable CAS capacity. It is unclear what are the basis for establishing protective zones of 250 m and 1 km for the pinniped and cetaceans, which may be encountered within Lunskoye field in the process of seismic survey? Such distances are not safe for the sense of hearing of critically protected western gray whales and other cetaceans that are expected to be encountered within the Lunskoye field area. Safety protective zones for different types of marine mammals should be established depending on CAS impact on the particular marine mammal hearing, CAS specific configuration (precise data on emitting power), as well as relevant data obtained in the process of testing conducted at the Lunskoye field area. The protective zones of minimum 5 km distance from the CAS should be established for the Red Book and unidentified marine mammals. For other marine mammals it should be necessary to established at least 1 km protective zone. Such protective zones provide for timely impact minimization activities to be undertaken. *Sakhalinrybvod* is going to second at least two experts to conduct marine mammals monitoring programme aboard the seismic vessel. The monitoring programme will first and foremost include CAS minimization impact covering procedures of smooth activation and deactivation of the CAS when required in	The safety distances of the protective zones will be based on actually measured noise levels. The quoted distances are estimates based on scientific studies. The actual distances will be determined at the start of the operations. The first distance, 250 m, is an estimate, which describes a distance from the main source of the noise (one of the two air gun arrays) to a location at sea, where the noise has reduced to 190 dB (1µPa rms over duration of pulse). The second distance, 1 km, is an estimate, which describes a distance from the main source of noise to a location at sea, where the noise has reduced to 180 dB (1µPa rms). These two noise levels are well-published threshold levels for cetaceans and pinnipeds, below which no hearing or physical damage is expected and above which there is uncertainty concerning the level at which such damage might occur. Safe distances will be established in the field. SEIC does therefore not necessarily agree with Sakhalinrybvod's statement that these distances are not safe before a technical evaluation in the field. The distances quoted by Sakhalinrybvod are not supported by the scientific literature, assuming that the safety zone should be the area within which there is some risk of injurious effect. Additional survey data from 2002 is provided within *Section 4* of this report. SEIC will have two trained and experienced Marine Mammal Observers from Sakhalin State University on board. It is felt that it is excessive to send additional to these Sakhalinrybvod fishery experts. It was agreed with the Sakhalin Fishery authority SakhRybVod that a safety distance of 2500 m would be observed for all large whales. Furthermore, an agreement was reached with SakhRybVod that a minimum safety distance for smaller whales and

	the process of seismic operation within the Lunskoye field area.	pinnepeds of 500 m would be adopted.
Sakhalinrybvod 27-2-2003	ES only slightly touches upon the issues of fisheries productivity at the Lunskoye field area. Thus, p. 5-32 Item 5.3.12 contains the following conclusion: *… information on commercial fish distribution along the northeastern coast of Sakhalin Island does not confirm the availability of the ichthyofauna within the Lunskoye field area*. It is unclear what scientific fisheries studies served the basis for such a conclusion, if Item 4.12.4 refers to the map depicting main fishing grounds proving the availability of commercial fish, crabs and shrimps within the Lunskoye field area.	SEIC commissioned a report on commercial fishing activities from Sakhalin Fishery Association that shows that there are no commercial fishing activities in the area that could be affected. See also section 3 of this addendum.
Sakhalinrybvod 27-2-2003	In 2001 *Sakhalinrybvod* approved the SEIC Programme for Baseline Studies of Marine License Areas Northeast of Sakhalin, including Lunskoye field. So far *Sakhalinrybvod* received no results of the aforementioned studies and would suggest SEIC provide the relevant report. Inshore waters northeast off Sakhalin are the summering grounds for the pacific salmon fish fries, including fish fry of the Red Book taimen. In the event ES developers don't have sufficient actual information on distribution of water biological resources within the Lunskoye field area during the most productive summer season (July - August) they can obtain relevant data upon the organisation of specialised scientific studies conducted with fisheries scientific and research institutes (*VNIRO, TINRO-Center, SakhNIRO*) involved under the programme approved by *Sakhalinrybvod.*	The conclusions of the ES were that there would be no significant impacts on fisheries from the planned survey. Baseline information from the fisheries scientific research institutes, as well as studies commissioned by SEIC, were used in the preparation of the ES.
Sakhalinrybvod 27-2-2003	It should be required to calculate fishery stock damage and compensation activities for water biological resources such as plankton, zooplankton, ichthyoplantkon, etc. which will be undoubtedly impacted in the process of seismic operations at Lunskoye field. Damage calculation should be made on the basis of precise data on CAS configuration and summary emitting power to be used during seismic operations at Lunskoye field and actual data on summer distribution of water biological resources within the Lunskoye field area.	A separate report on fish damage calculation has been prepared by SEIC. This report contains more information on expected levels of impacts on the fish stock of Lunskoye field area as a result of the seismic survey. A summary of this report is included within *Section 3.1*.
Sakhalinrybvod 27-2-2003	In the process of seismic operations at Lunskoye field and upon their completion it should be required to conduct monitoring programme approved by *Sakhalinrybvod.* In the outcomes of such monitoring the actual information on seismic impact on water biological resources will be obtained.	The predicted impact on the marine habitat (other than on marine mammal) is minor. Accordingly, SEIC sees no justification for conducting a monitoring programme to address these issues.
NGOs		
SEW 20-6-2003	With this letter we would like to ask the management of your company to postpone planned seismic survey till that time when your company has conducted all required research to ensure the safety of fishery resources migrating across Lunskoye field area. Recent world scientific research proves that seismic survey operations can have serious and damaging impact on	Following up on the previous comment from SakhNIRO, the planning of the survey is designed to minimise impacts on western gray whales. The planned schedule is considered to be the optimum, and no other options are considered suitable. Moving the survey into the winter time, as suggested by SEW, is not technically possible in view of the ice conditions (Note: The survey will take up to 8 weeks). Moreover, as

	fishery resources. Besides that, during the fishing season last year Sakhalin fishermen, fishing in the area of Pogranichnoye Settlement on the eastern cost of Sakhalin, faced an alarm fact. Seismic operations, conducted in September 2002 under Sakhalin-6 project at Pogranichnoye downfold (in the area of salmon dragnet placement), has practically chased fish from this area. Fishermen have very clearly determined that straight after the commencement of seismic vessel offshore operations, dragnet tack abruptly stopped, i.e. during seismic survey operations fish was not approaching the coast at all. Without any doubt, this issue should be specially investigated. Until final results of such investigation are not available, we think it is impermissible to carry out seismic operations during spawning season, as well as in the period when alevins migrate from rivers to the sea. It is possible that seismic survey had so much impact on salmon that approaches the shore that fish has lost its capability of homing to return for spawning to those rivers where it was born. You know, of course, how important salmon is for the nature and economics of Sakhalin, for Sakhalin citizens and indigenous population survival. That is why we would like to ask Sakhalin Energy to postpone seismic operations till the moment when it is known for sure that seismic operations would not have damaging impact on salmon and not create obstacles for salmon homing. As a compromise variant, we consider conduction of seismic survey operations on Lunskoye field outside the salmon spawning period and alevin migration from rivers to the sea. Alevins migrate down the rivers to the sea from the beginning of May till June and fatten the following 2-3 months in the near-shore shelf zone. Salmon (of several species) approaches eastern cost of the island and returns back to the rivers in the period from the beginning of May (salmon trout) till the middle of October (silver salmon). Unfortunately, we cannot recommend conducting seismic operations from October 15 till November 15 because of migration of western gray whales, entered into Red Data Book, across this area exactly in this period. That is why we suggest Sakhalin Energy to conduct seismic survey in the period after November 15, 2003 or before May 15, 2004. Another acceptable option from our point of view is to review the possibility of special scientific research to ensure that seismic survey on Lunskoye field would not have negative impact on Sakhalin salmon and western gray whales.	already suggested by SEW, moving the survey into the migration months of the gray whales to reduce the impact for the migration of common salmon is not an acceptable concept. We consider that the scientific article presented by SEW is flawed: the author states that the fish would have fled if they were not in the cage. The point made in the article, is that fish (note: the research was actually undertaken on one species only) can have a permanent threshold shift and might exhibit behaviour changes, if exposed to noises above 180dB for some time. However, in open sea conditions, fish exhibit a behavioural response to noise by temporarily moving away from the source. As noted in the sections above, no major salmon rivers have been identified to have outfalls in the vicinity of the Lunskoye Field, there is no evidence to suggest that the `area is of particular importance to salmon species, and no significant impacts are predicted to occur to any salmon that may be within the vicinity of the field during the survey. The Pogranichnoye settlement identified by SEW is located over 100km to the south of the Lunskoye Field, and therefore the presence of salmon in this area is not relevant to the assessment of impacts relating to the proposed survey.
RGS 30-1-2003	The main hazards and risks during the seismic surveys are associated with physical impact and consequences of disturbance first of all in relation to acoustic impact of the surveys on the marine environment, particularly on the western gray whale population. It is reasonable to include two Russian	The Sakhalin State University will supply the marine mammal observers (MMOs). RGS might wish to approach Sakhalin State University and ascertain, whether candidates nominated by them could be included in the MMO programme.

	scientists mentioned in the references hereto into the group of marine mammal observers on the support vessel.	
RGS 30-1-2003	In view of the insufficient information on the hydrodynamic regime, hydrometeorological conditions and air-sea interaction processes, as well as due to the presence of potential risks of hazardous marine phenomenon in the area of the north-eastern coast of Sakhalin Island, the Presidium of the Expert Commission of SakhRGO considers it reasonable and requests to consider the possibility of participation in the expedition of one oceanologist specialising in marine phenomenon stuides. Since the seismic vessel will be sailing within a limited area of the sea, this will allow obtaining additional scientifically justified and practically significant information about the relation between atmospheric and hydrodynamc processes in the sea.	Due to a lack of space on the vessels, this is unfortunately not possible.
RGS 30-1-2003	Assessment of nature and probability of impact on the environment in the considered document is provided in full covering all parameters.	Comment is noted.
RGS 30-1-2003	The developed system of impact mitigation measures, monitoring plans and management procedures promote minimisation of potential impact on the environment to as low as reasonably practicable.	Comment is noted.
RGS 30-1-2003	The proposed measures allow reducing the impact to a moderate level.	Comment is noted.
RGS 30-1-2003	Elaboration of initial materials in terms of issues of ensuring environmental safety of offshore operations, information of planned measures to protect marine mammals, substantion of measures to prevent environmental pollution and non-reversible ecological processes in the offshore area of the Sakhalin Island is sufficient which allows considering seismic survey in the Lunskoye License Area in 2003 under Phase 2 of the Sakhalin-II Project as possible.	Comment is noted.
General public consultees (written comments only)		
Comment from public, Tomari Library 3-7-2003	I have only positive response. The materials provide a comprehensive description of environmental and socials aspects	Comment is noted.
Comment from public, Tomari Library 3-7-2003	Respond positively	Comment is noted.

Comment from public, Tomari Library 3-7-2003	All technical, social, and environmental aspects have been considered in the document. The materials are presented in a very good way	Comment is noted.
Comment from public, Tomari Library 3-7-2003	The materials are well-presented. Apparently, preparation of the documents required many efforts	Comment is noted.
Comment from public, Tomari Library 3-7-2003	The materials are colourful, informative and detailed	Comment is noted.
Comment from public, Tomari Library 3-7-2003	The materials provide a comprehensive description of Company's activities	Comment is noted.
Comment from public, Tomari Library 3-7-2003	I am not a technical expert but in my opinion the project is technically perfect	Comment is noted.
Comment from public, Tomari Library 3-7-2003	The project was prepared by specialists whom we can trust	Comment is noted.
Comment from public, Tomari Library 3-7-2003	I have no comments, since the project was designed by specialists and I am only an ex-driver. I will be very glad if the Oil Export Terminal and the first LNG plant in Russia are constructed. I wish you good luck.	Comment is noted.
Comment from public, Tomari Library 3-7-2003	Only technical specialists can comment on the technical aspects and I am not one of them.	Comment is noted.
Comment from public, Tomari Library 3-7-2003	The project was designed by specialists. Therefore it must be well-prepared.	Comment is noted.
Comment from	I suggest that the level of Russian participation should be as high as possible.	Comment is noted.

public, Tomari Library 3-7-2003		
Comment from public, Tomari Library 3-7-2003	The environmental component of the project is impressive. But what is the most important is that all listed measures are actually implemented	Comment is noted. SEIC is fully commited to ensure implementation of all listed mitigation measures.
Comment from public, Tomari Library 3-7-2003	I hope that what is written on the paper will fully correspond with the reality and that there will not be any unpleasant surprises that would lead to environmental disasters	Comment is noted. SEIC is fully commited to ensure implementation of all listed mitigation measures.
Comment from public, Tomari Library 3-7-2003	The documents available in the libraries provide comprehensive description of environmental aspects of the project. The most important thing is to actually carry out all plans	Comment is noted. SEIC is fully commited to ensure implementation of all listed mitigation measures.
Comment from public, Tomari Library 3-7-2003	This issue requires thorough studies since the documents provided by the Company, which is interested in project development, do not allow forming a sound and unbiased judgement.	Comment is noted. SEIC has engaged the independent environmental consultatnts ERM and LGL to execute this environmental assessment. The findings and judgements presented in this ES are therefore of an independent nature and do no necessarily reflect the companies position.
Comment from public, Tomari Library 3-7-2003	Any human intervention in nature creates environmental hazards. Some problems will, of course, arise.	Comment is noted.
Comment from public, Tomari Library 3-7-2003	We should never forget about the environment. Wildlife protection and environmental safety of the projects must be the tasks of highest priority	Comment is noted.
Comment from public, Tomari Library 3-7-2003	Distribution of this questionnaire among the people who are ignorant and incompetent in this issues is nothing but a promo trick and as such it cannot contribute to the development of the subject.	SEIC wishes to inform the public about its plans and values all the comments from the public. This ES status was written in a manner to be presentable to a wide audience. SEIC realises, however, that this issues presented are often of a rather technical nature, and may not (all) be understandable to everybody.
Comment from the public, Tomari Library 3-7-2003	The projects wins respect for the Company through its continues efforts in sponsoring various sports events	The comment is noted.
Comment from the public, Tomari	I would like to wish the Company prosperity and success in implementing the project.	The comment is noted.

Library 3-7-2003		
Comment from the public, Tomari Library 3-7-2003	I hope that the Company will meet all its commitments	The comment is noted. SEIC is fully commited to ensure implementation of all listed mitigation measures.
Comment from the public, Tomari Library 3-7-2003	I hope that the Project will always be beneficial to the Sakhalin Oblast ensuring creation of new working places for local people and supporting social projects	The comment is noted. SEIC is continuously undertaking much efforts to ensure benefits of the project to the local population.
Comment from the public, Tomari Library 3-7-2003	I suggest that the Company should take a more active part in social and cultural life of Sakhalin not forgetting the districts and people who live there. I wish you success and prosperity.	The comment is noted. SEIC is continuously undertaking much efforts to ensure benefits of the project to the local population.

3 SUPPLEMENTARY DATA AND ADDITIONAL MITIGATION MEASURES

This section provides a summary of the fish damage calculation report produced by SEIC and details of additional measures to mitigate environmental impacts associated with the Lunskoye survey to *as low as reasonably practicable* (ALARP) levels.

3.1 SUPPLEMENTARY DATA: FISH DAMAGE CALCULATION REPORT

In line with the requirements of the Russian Federation, a fish damage calculation report has been produced by SEIC. This section provides a summary of the main findings of this report.

Calculations have been carried out using data and values determined by SakhNIRO, and the specifications for the Lunskoye seismic survey. The method estimates the volume of planktonic organisms that would be expected to be impacted by the survey operations, and multiplies the value by coefficients, predetermined by Russian Federation guidance, to obtain values for predicted effects to fish species. The method assumes an unvarying, standard marine environment and plankton concentration.

3.1.1 *Agreed Compensation*

To indemnify fishery resources damage in accordance with the current RF guidelines, a provision of funds is required for construction or reconstruction of aquaculture facilities. In the Sakhalin region, these aquaculture facilities are salmon fish farms.

After agreement with Sakhalinrybvod, compensation payments for operations in the area of north-east shelf of Sakhalin should be forwarded for reconstruction of a salmon fish farm in the Ado-Tymovo Settlement. The value of compensation is defined on the basis of costs required for calico salmon farming in volumes corresponding to the caused damage in natural units (calculated in the fish damage report).

The main target species in waters of north-east Sakhalin lagoons are salmon, and in particular, calico salmon. Compensation has been based on a value of 1 ton calico salmon = $3719 (based on Japanese market value).

According to *Clause 4.1* and *4.2* of RF *"Provisional guidelines…"* (1990), compensation costs are estimated on the basis of unit investment rate and current costs (operational costs) per production capacity unit (commercial return) of fish resources reproduction enterprise.

For Ado-Tymovo salmon fish farm, unit investments per 1000 calico fish migrants is $324, operational costs are $12, commercial return coefficient is

0.5%, average fish weight in commercial return is 3.8 kg [(1)]. As 1000 calico fish migrants produce 5 spawners of 19 kg total weight, unit capital investments are $324/19 = $17.05/kg, or $17,053/t. The operational cost rate is therefore $12/19kg = $0.632/kg respectively.

Depending on a choice of two profile shooting options, 0.955 or 0.372 tonnes of fish production (in natural units) will be lost as a result of the Lunskoye seismic survey. One tonne of fish from the north-east Sakhalin region (including plankton feeders only) costs $1,608.0. A 1/8.3 reduction factor is then applied equal to the ratio of negative operations impact duration (1 year, for every year of operations) to capital investment payback time rate (8.3 years). Operational expenditures provide for the use of facilities constructed during the reviewed period.

The total compensation payment required for Sakhalin fish resources rehabilitation measures to compensate for the damage associated with seismic survey project will be between $2565.68 and $999.40.

3.2 *ADDITIONAL MITIGATION MEASURES*

Three additional mitigation measures, and an alteration to an existing mitigation measure will be incorporated into the Lunskoye seismic survey as summarised below.

- A synthetic form of kerosene, Isopar M®, will be used within the streamers to reduce the potential environmental impacts in the event of damage to the streamers and subsequent spillage to the marine environment.

- Passive acoustic monitoring (PAM) equipment will be used on board the seismic survey vessel to further reduce the possibility of marine mammals moving within the range in which adverse impacts could occur without being detected.

- The survey vessel will have a bilge water tank and will not discharge any water containing oily effluent or residual chlorine into RF water.

- The ramp up / soft start procedure will be lengthened from 20 minutes to 30 minutes.

- The minimum safety distance to large whales was set at 2500 m. The minimum safety distance to small whales and to pinnepeds was set at 500 m.

The subsections below describe these measures in greater detail.

(1) Based on information provided by Sakhalinrybvod in their letter 10-2909, dated 10.12.98.

3.2.1 *Isopar M®*

Isopar M® is a synthetic isoparaffinic hydrocarbon, distributed by Exxon Mobil. The fluid has a very high purity and uniform composition, and is virtually free of polar compounds and other reactive materials. This ensures that in the event of a spill, adverse impacts will be minimised.

3.2.2 *Passive Acoustic Monitoring*

PAM equipment from the specialist geophysical supplier *Seamap* will be used during the Lunskoye seismic survey. The equipment will consist of a 56 m array with a 300 m lead-in, and a PC with PAM monitoring and detection software. The software can recognise and locate dolphins and whales in the vicinity of the survey from their vocal communications. The system is interfaced with a Global Positioning System (GPS), which provides the latitude and longitude of the detected vocalisation, together with real time details of range and bearing.

PAM will be used in addition to the visual observation, which will be conducted by onboard MMOs.

3.2.3 *The Disposal of Oily Effluent and Residual Chlorine*

The discharge of oily effluent and residual chlorine is prohibited under the *National Regulations for Protection of Inshore Sea Waters of 1984*. The survey vessel will therefore have a bilge water tank and will not discharge any water containing oily effluent or residual chlorine into RF waters.

3.2.4 *Ramp Up Procedures*

The ramp up period will be extended from 20 to 30 minutes. This will allow marine mammals and other marine organisms *eg* fish additional time to move out of the area before a peak acoustic noise level is reached.

3.2.5 *Minimum Safety Distances*

As stated in the Environmental Statement, safety distances will be determined in the field, at the start of operations, based on actual measured noise propagation in the water. For pinnepeds, this distance is defined as the distance from the airguns where the noise level has been reduced to 190 dB. For ceteceans (whales, porpoises and dolphins), the acceptable noise level has been determined at 180 dB. Should any marine mammals be observed within the thus established distance from the source, the survey will not be started or an ongoing survey will be halted until the animal has left the zone.

In addition to this principle, a number of minimum safety distances was agreed upon with Sakhalinrybvod:

- For large ceteceans, the safety distance whall be a minumum of 2,5 km. Large ceteceans in the survey area are considered to be Western Gray Whales, North Pacific Right Whales, Bowhead Whales, Fin Whales, Sperm Whales, Baird's Beaked Whales, Killer Whales and Minke Whales.
- For pinipeds and smaller ceteceans (including dolphins and porpoises) the minimum safety distance shall be 500 m.

The following six figures summarise the results of the 2002 and 2003 aerial survey programme results for the Lunskoye area.

Figures 1 to *4* show the western gray whale sightings recorded between July and November 2002. *Figure 5* shows all of the sightings for this period. It can be seen from this data that no western gray whales were observed within the Lunskoye Field during the monitoring programme, with one individual being recorded inshore of the field in the period between the 27th July and the 2nd of August. *Figure 6* shows the results of the July 2003 aerial survey.

The first year that aerial survey coverage extended as far south as Lunsky Bay was 2000; coverage on those Extensive surveys was approximately 20%, transects extended from the coast to beyond the 50 m depth contour, and surveys were flown during 23 to 24 June, 19 to 20 July, 26 August, 6 September, 13 October, and 19 to 20 November. No western gray whales were sighted near Lunskoye; the furthest south that a western gray whale was recorded was at 52˚00'N, 143˚31'E, off the north end of Nyiskii Bay.

In 2001, similar surveys were flown; those that included the Lunskoye area were on 18 July, 13 September, 24 September, 9 October, 23 October, and 18 November. No western gray whales were seen. However, en route to a survey of the Piltun area, one was seen about 8 km north west of the northwest corner of the Lunskoye Field on 8 August. There was no evidence of feeding (no mud plumes).

The 2002 surveys of the Lunskoye area included both Extensive and Intensive (100%) coverage. Extensive surveys were flown on 30 July, 4 September, and 9 October. Intensive surveys of the Lunskoye area were flown on 28 July, 4-5 September, 9 October, and 17-18 November. Western gray whales were sighted only once: four whales were seen about 3 km inshore from the northwest corner of the Lunskoye Field on 28 July. There was no evidence of feeding.

The 2003 survey programme is currently underway, with two surveys having been completed. On the 7th June 2003, an aerial survey (intensive survey) of the Lunskoye Field was undertaken. No western gray whales were seen. Earlier this month, (July 2003), an aerial survey covering Lunskoye was completed. No gray whales were recorded, but the survey was partially obscured by the persistence of thick fog in the southern section of the survey area.

An SEIC technical survey was also undertaken in the waters east of Sakhalin Island between 24th May and 3rd July 2003. The survey vessel had marine mammal observers on board and covered (amongst other areas) the Lunskoye Field. The vessel spent 5 days in the area. No gray whales were seen at the start of the survey (5th June, 6th June and 9th June), however, during the return trip on the 29th and 30th June, two gray whales were seen near Lunskoye at a distance of 1.8 km from the vessel. The whales were heading in a northerly

direction, consistent with the direction of migration to summer feeding grounds in the North.

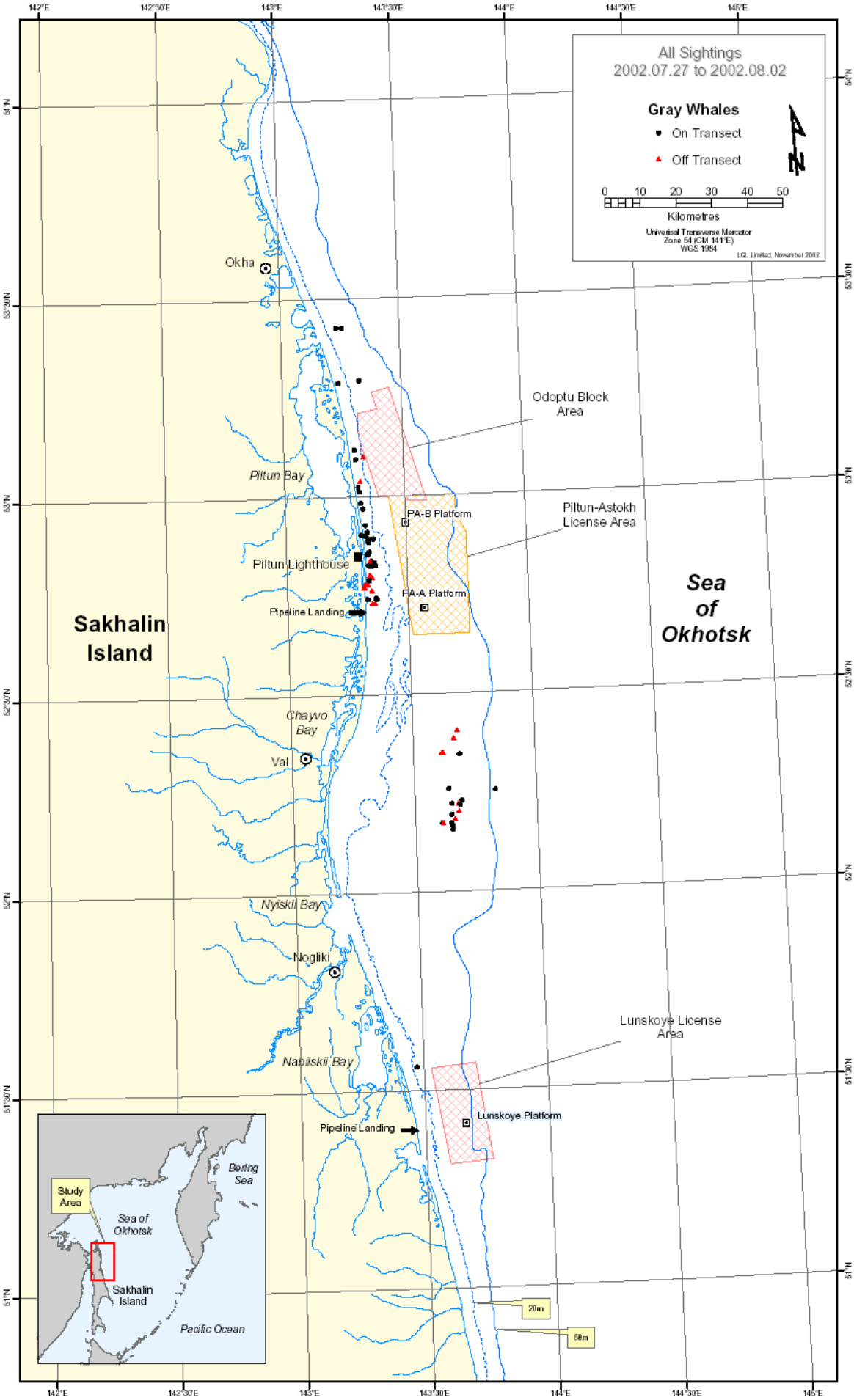
All Sightings
2002.07.27 to 2002.08.02
Gray Whales
On Transect
Off Transect
0 10 20 30 40 50
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, November 2002
Okha
Odoptu Block Area
Piltun Bay
PA-B Platform
Piltun-Astokh License Area
Piltun Lighthouse
PA-A Platform
Pipeline Landing
Sakhalin Island
Sea of Okhotsk
Chayvo Bay
Val
Nyiskii Bay
Nogliki
Lunskoye License Area
Nabilskii Bay
Lunskoye Platform
Pipeline Landing
Bering Sea
Study Area
Sea of Okhotsk
Sakhalin Island
Pacific Ocean
20m
50m
142°E
142°30'E
143°E
143°30'E
144°E
144°30'E
145°E
54°N
53°30'N
53°N
52°30'N
52°N
51°30'N
51°N

Figure 1

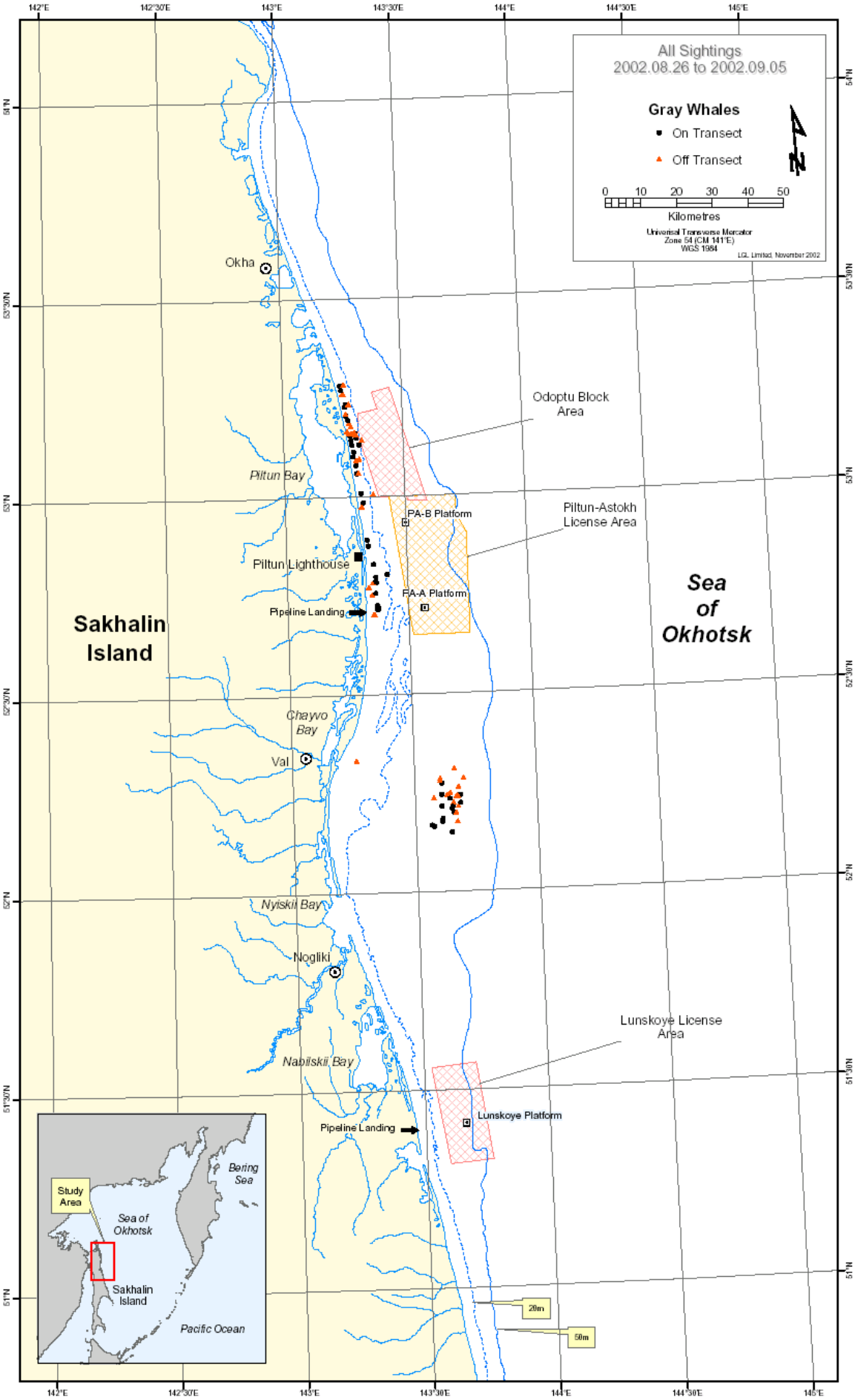
All Sightings
2002.08.26 to 2002.09.05
Gray Whales
On Transect
Off Transect
0 10 20 30 40 50
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, November 2002
Okha
Odoptu Block Area
Piltun Bay
PA-B Platform
Piltun-Astokh License Area
Piltun Lighthouse
PA-A Platform
Pipeline Landing
Sakhalin Island
Sea of Okhotsk
Chayvo Bay
Val
Nyiskii Bay
Nogliki
Lunskoye License Area
Nabilskii Bay
Lunskoye Platform
Pipeline Landing
Bering Sea
Study Area
Sea of Okhotsk
Sakhalin Island
Pacific Ocean
20m
50m
142°E
142°30'E
143°E
143°30'E
144°E
144°30'E
145°E
54°N
53°30'N
53°N
52°30'N
52°N
51°30'N
51°N

Figure 2

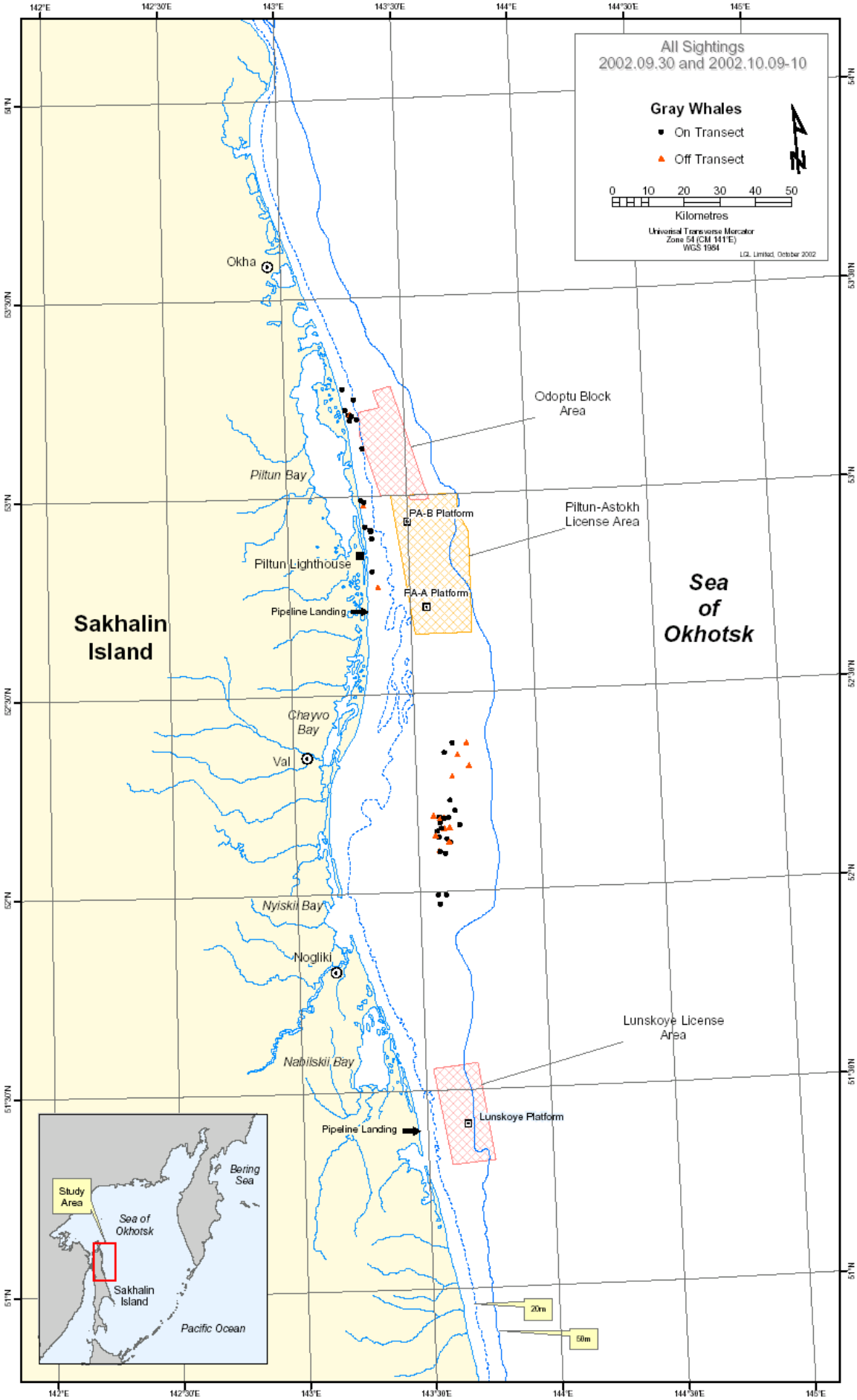
All Sightings
2002.09.30 and 2002.10.09-10
Gray Whales
On Transect
Off Transect
0 10 20 30 40 50
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, October 2002
Okha
Odoptu Block Area
Piltun Bay
PA-B Platform
Piltun-Astokh License Area
Piltun Lighthouse
PA-A Platform
Pipeline Landing
Sakhalin Island
Sea of Okhotsk
Chayvo Bay
Val
Nyiskii Bay
Nogliki
Lunskoye License Area
Nabilskii Bay
Lunskoye Platform
Pipeline Landing
Bering Sea
Study Area
Sea of Okhotsk
Sakhalin Island
Pacific Ocean
20m
50m

Figure 3

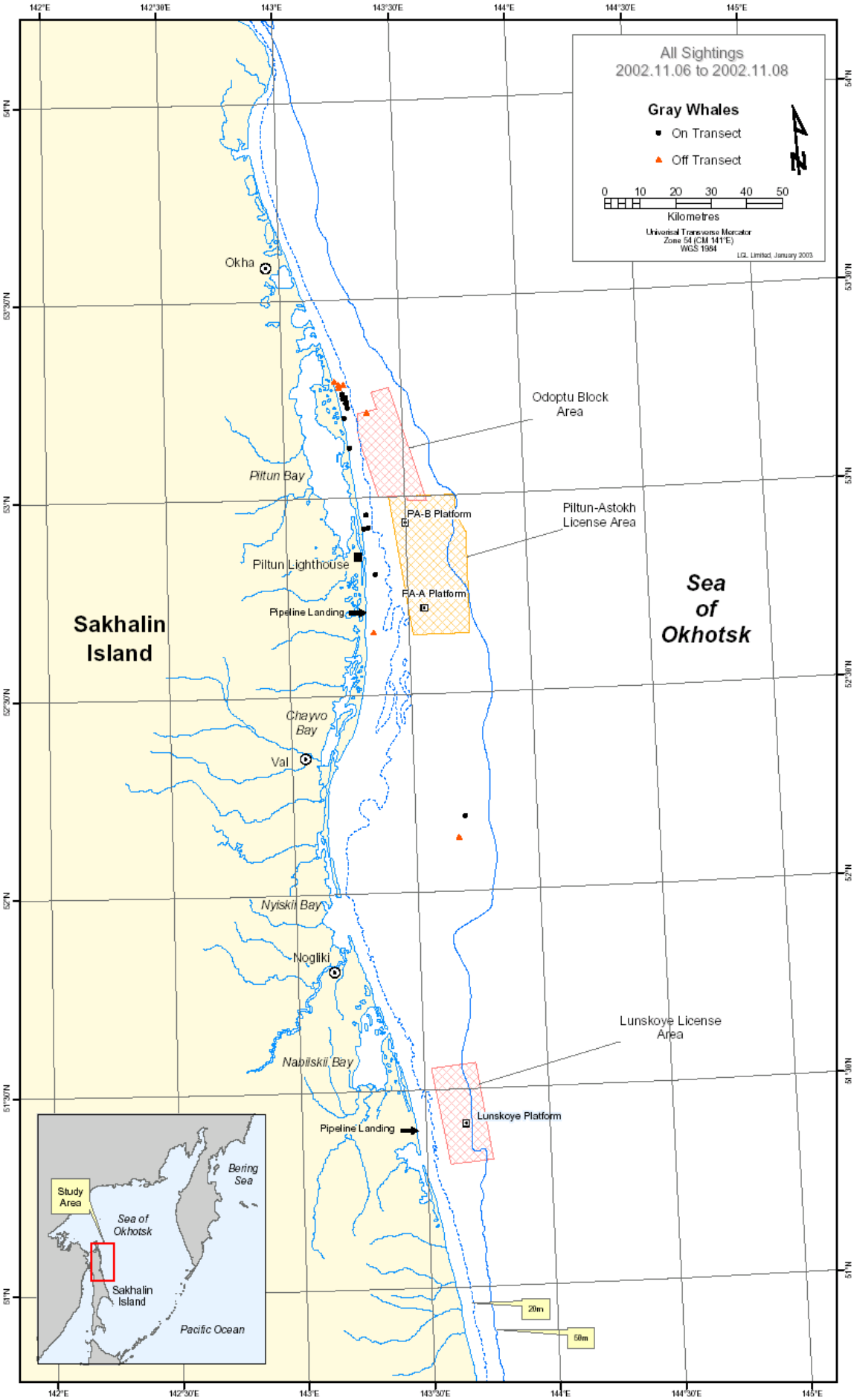
All Sightings
2002.11.06 to 2002.11.08
Gray Whales
On Transect
Off Transect
0 10 20 30 40 50
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, January 2003
Okha
Odoptu Block Area
Piltun Bay
PA-B Platform
Piltun-Astokh License Area
Piltun Lighthouse
PA-A Platform
Pipeline Landing
Sakhalin Island
Sea of Okhotsk
Chayvo Bay
Val
Nyiskii Bay
Nogliki
Lunskoye License Area
Nabilskii Bay
Lunskoye Platform
Pipeline Landing
Study Area
Bering Sea
Sea of Okhotsk
Sakhalin Island
Pacific Ocean
20m
50m
142°E
142°30'E
143°E
143°30'E
144°E
144°30'E
145°E
54°N
53°30'N
53°N
52°30'N
52°N
51°30'N
51°N

Figure 4

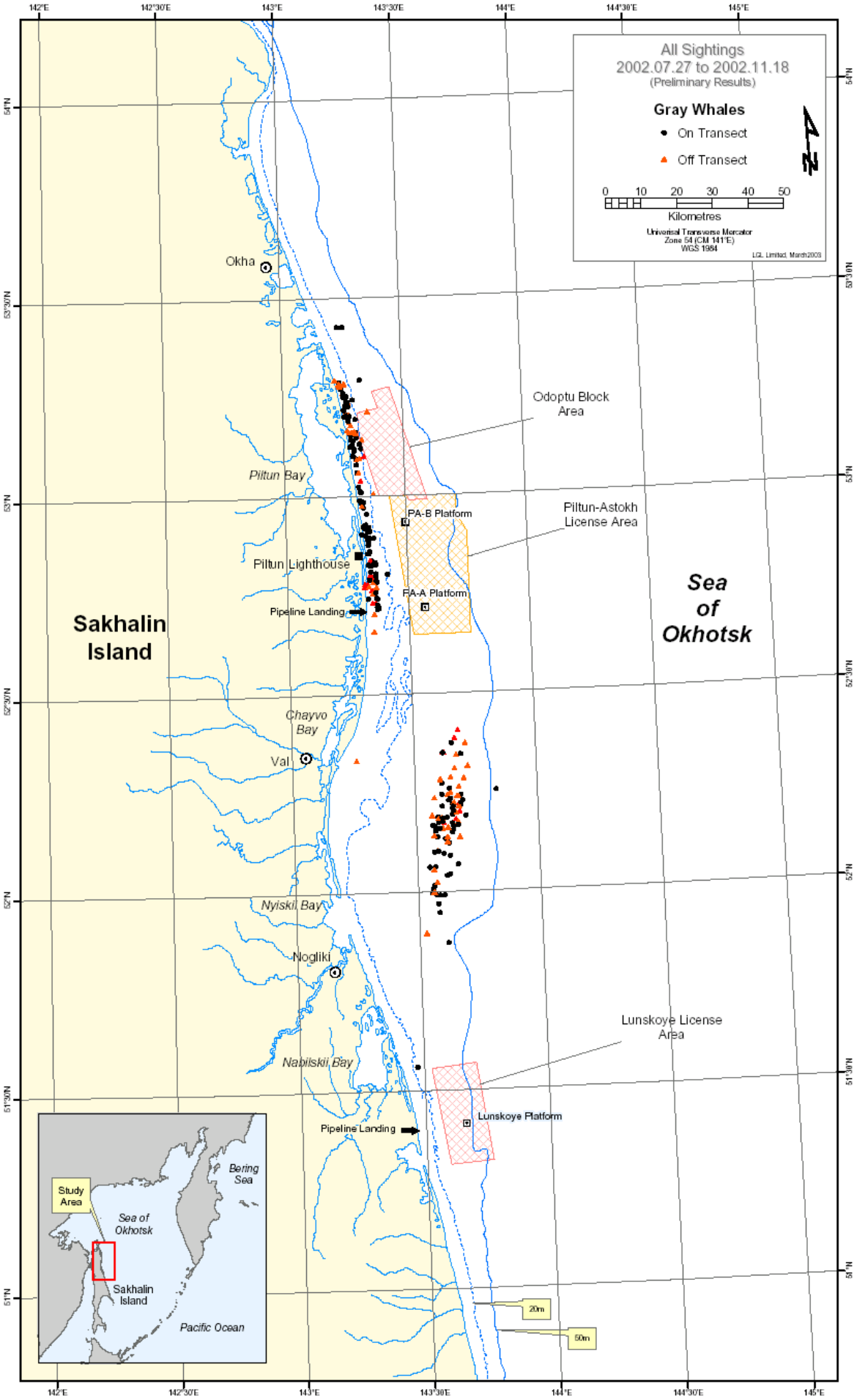
All Sightings
2002.07.27 to 2002.11.18
(Preliminary Results)
Gray Whales
On Transect
Off Transect
0 10 20 30 40 50
Kilometres
Universal Transverse Mercator
Zone 54 (CM 141°E)
WGS 1984
LGL Limited, March 2003
Okha
Odoptu Block Area
Piltun Bay
PA-B Platform
Piltun-Astokh License Area
Piltun Lighthouse
PA-A Platform
Pipeline Landing
Sakhalin Island
Sea of Okhotsk
Chayvo Bay
Val
Nyiskii Bay
Nogliki
Lunskoye License Area
Nabilskii Bay
Lunskoye Platform
Pipeline Landing
Study Area
Bering Sea
Sea of Okhotsk
Sakhalin Island
Pacific Ocean
20m
50m

Figure 5

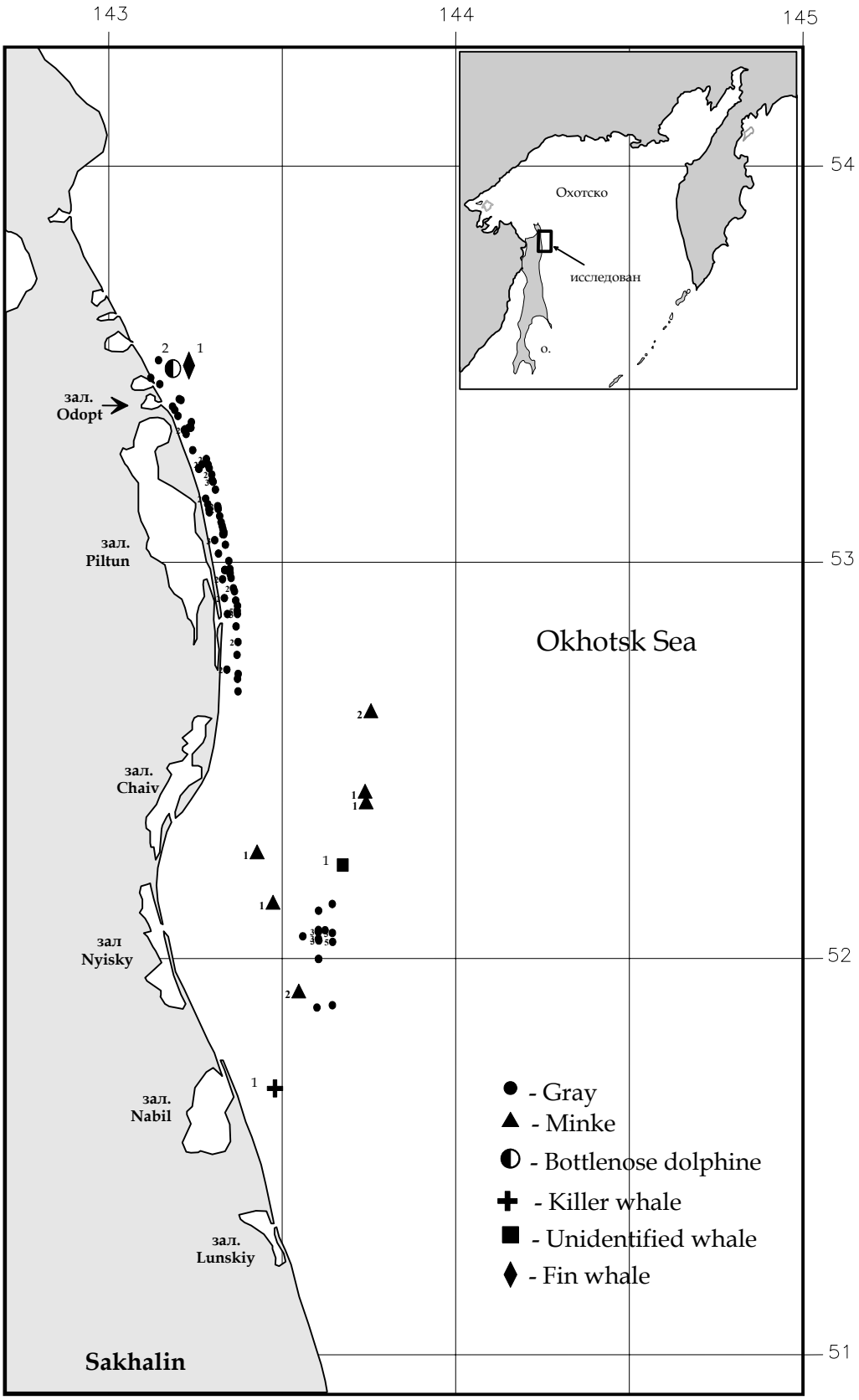

Figure 6: Distribution of Cetaceans along north east coast of Sakhalin – July 5-15, 2003 (by aerial surveys, Antonov-28 Fixed wing)

5 CONCLUSIONS

The potential environmental impacts of the proposed 2003 Lunskoye seismic survey were assessed through a process of Environmental Impact Assessment and reported in the *Lunskoye Seismic Survey 2003: Environmental Statement*. This supplementary report has presented the consultee comments and queries, and has described additional mitigation measures that have been developed to ensure that environmental impacts associated with the Lunskoye seismic survey programme have been reduced to as low as reasonably practicable levels. It is therefore concluded that providing the mitigation measures proposed in the *Lunskoye Seismic Survey 2003: Environmental Statement*, and this supplementary report are developed, incorporated into the survey EMP and monitored to reduce impacts then there will be no *major* environmental impacts and all *moderate* impacts will be reduced to ALARP levels.

6 ABBREVIATIONS

Abbreviations used in the text:

Abbreviation	Term
ALARP	As Low As Reasonable Practicable
CAS	Compressed Air Source, cylinders, which will be filled with air and controlled released to produce a seismic wave to undertake the survey
CSIR	African Council for Scientific and Industrial Research
dB	deci Bel, a unit on a logarithmic scale to measure sound energy
EIA	Environmental Impact Assessment, a method to assess and mitigate environmental impact
ES	Environmental Statement
JNCC	Joint Natural Conservation Council, a UK organisation
MMO	Marine Mammal Observers, Marine Mammals include whales, dolphins and seals
NGO	Non-governmental Organisation
ppm	parts per million
PR	Public relation
RMS	Root Mean Square
SakhNIRO	The Sakhalin Fishery Institute
SakhRybVod	The Sakhalin Fishery Authority
SEIC	Sakhalin Energy Investment Company Ltd.
SEL	Sound Exposure Level, a measure of the total acoustic energy in a transient sound
SEW	Sakhalin Environmental Watch, a NGO
TEO- (C)	Technical and Environmental Substantiation of a Project, a Russian approval system
WWF	World Wildlife Fund

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