NON-TECHNICAL SUMMARY

Proposed Project

TGS-NOPEC Geophysical Company ASA (TGS) proposes to undertake a two dimensional (2D) seismic survey and seabed sampling in the off South West Greenland between 1 June and 15 October 2013.The Survey Area (Figure A) lies to the south of areas where significant sea ice is expected. The survey will mainly take place offshore in relatively deep water beyond the continental shelf but there are some areas of banks which are relatively shallow. The survey will take place at least 12nm offshore at all times.

2D seismic surveys such as this contrast with more intensive 3D surveys where survey lines are much more closely spaced and very detailed information is collected, but over smaller areas. This is an important point in relation to the assessment since it means that any environmental effects from 2D surveys at a given location will be very short term. In contrast, the survey will take place over a relatively large area and thus has potential to affect a wider area, albeit less intensively.

The purpose of the project is to acquire geophysical and geological data that will be used by various clients (exploration companies) to prospect for hydrocarbon resources. The data acquired by the survey will contribute to a more accurate and advanced understanding of the geology and hydrocarbon potential of the area. Conducting the project as a multi-client project will eliminate (or significantly reduce) the need for the various different exploration companies to acquire the same data independently and thereby limit the overall impact to the environment.

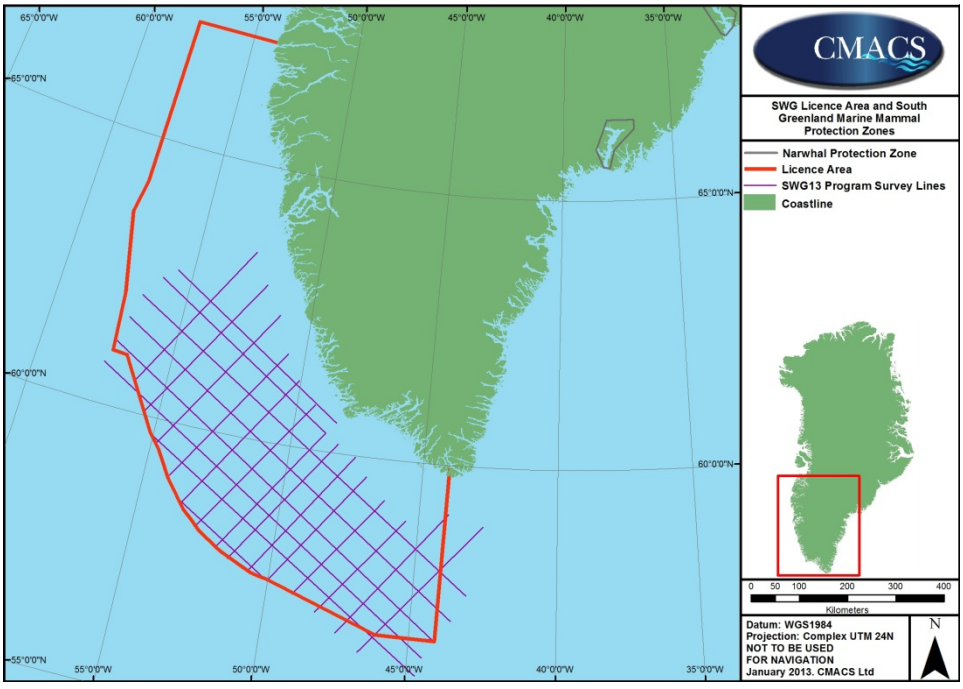

Figure A: location of proposed seismic survey lines (crossed purple lines, known as the Survey Area) within TGS Licence Area (thick red line). Seismic Protection Zones for marine mammals are also indicated.

Seismic surveys acquire data on seabed geology using subsurface acoustic (sound) reflections to identify boundaries between different geological layers. The acoustic source is provided by an array of airguns towed approximately 250m behind a 'source' vessel which also tows an array of hydrophones to 'listen' to the reflected sound. The hydrophone arrays are known as streamers and will be towed around 8km behind the source vessel. The survey lines are expected to be very widely spaced (31-66km apart). Up to 5,000km of lines will be surveyed. The source vessel will be assisted by another vessel, a support vessel. A helicopter will be available to assist but is not expected to be used frequently.

The airgun array will have a volume of 3,680 cubic inches and as with all such technology generates considerable levels of underwater noise which this assessment seeks to understand and wherever possible mitigate (i.e. reduce the environmental impacts).

The vessel will conduct the survey whilst travelling at 5 knots with a firing interval of 10 seconds (approximately every 25m). The survey vessel is intended to be operational 24 hours a day except in periods where weather does not allow for data acquisition.

Whilst there may be some drift ice present no ice breaker will be used and the survey will not be able to enter into any areas of densely packed or fast ice that may be present in coastal areas.

The seabed survey will collect up to 100 gravity core and 20 dredge samples to provide supplementary geological data regarding previously identified areas of interest on the seabed as well as to ground-truth sediment data, including for areas where seismic data are insufficient or difficult to obtain. A separate survey vessel will undertake this work in a period between 1June and 15 October 2013, operating independently from the seismic survey. The precise seabed sampling locations will be developed and finalized through the summer.

Following submission of a Scoping Document which outlined the proposed survey specifications, Bureau Minerals and Petroleum (BMP), National Centre for Energy and Environment (DCE) and GrønlandsNaturinstitut (GINR) have advised TGS that an Environmental Mitigation Assessment (EMA) should be prepared. Comments have been received from BMP and its technical advisers which have been taken into account in the EMA.

The EMA has been prepared by Centre for Marine and Coastal Studies Ltd (CMACS) and NIRAS Greenland. CMACS is a specialist marine and coastal environmental survey and consultancy company. NIRAS Greenland, part of the NIRAS Group, is an engineering consultancy company with over 50 years of involvement in Greenland. The Greenlandic version of the report is translated by Greenland Consulting Services.

Ecology of the Area and Human Activities

The EMA summarises the various human activities and natural environment features that could potentially be affected by the survey. The natural environment includes seabed communities which in shallow areas, especially below 100m, are important areas of production supporting wider marine species. The area is of considerable importance to commercial and subsistence fishing and there is some hunting of marine mammals, focused in coastal waters inshore of the Survey Area.

Coastal areas are also of considerable importance to seabirds over summer months, some of which will pass through or may forage in the Survey Area.

A wide range of marine mammal species occur off South West Greenland and may be present in or around the Survey Area. The area is of very high importance in winter because it is generally not iced over but in summer species that are not associated with ice visit to feed on rich resources associated with areas of upwelling around the banks, especially to the north and south of the Survey Area.

Potential Impacts

A number of potential impacts of the seismic and seabed surveys were identified. Effects potentially giving rise to impacts are summarised in Table A, below.

Table A: Potential Impacts

Effect (Section)	Receptors Considered	Potential Impact(s) Assessed
Underwater noise of airgun array	Fish, Marine Mammals	Physical Injury Disturbance/displacement
Accidental oil/fuel spills	Fish, Birds, Marine Mammals, Benthic Habitats	Direct/indirect impacts through contamination of the marine environment as discussed
Conflicts with other human activities	Fishing, Hunting, Tourism	Lost time and income
Physical disturbance from seabed samplers	Benthic habitats	Damage to sensitive habitats
Attraction to vessels	Birds	Collisions/interference with

		normal behaviour, potentially fatal to individuals.
Collisions with survey vessels	Marine mammals, Birds	Death/injury for individuals

The underwater noise expected to be generated by the survey has been modelled to support the EMA. In summary:

- sound propagation from the seismic survey is expected to be much greater for lower frequency components of the sound spectrum;
- there will be rapid attenuation (noise reduction) over short distances (the first few hundred metres), especially of higher frequency sound;
- levels of noise that could injure marine mammals are not expected to be present more than 500m from the airgun array (potentially dangerous levels of noise may be present closer to the airguns)
- levels of noise that may disturb marine mammals are expected for some tens of kilometres around the survey.

Mitigation

Mitigation includes elements built in to survey planning, such as the presence of trained and experience marine mammal and seabird observers (MMSOs) with Passive Acoustic Monitoring (PAM) equipment. The MMSOs, PAM operators and survey technicians will together implement current Greenlandic marine mammal mitigation protocols that set out appropriate responses if marine mammals approach the airguns before or during airgun firing. Furthermore, additional elements following EMA (such as avoidance of certain areas of sensitive seabed habitat) will be implemented.

The following detailed mitigation is explained in the EMA:

- smaller volume seismic array to be used wherever possible;
- a mitigation gun will be available if needed, this is a single gun of low output;
- airguns will not be used unnecessarily at far distances from the transect line;
- two qualified marine mammal and seabird observers (MMSO) will be present on the source vessel with a minimum of one observer continuously monitoring visually during pre-firing watches;

- Passive Acoustic Monitoring (PAM) will be deployed during hours of darkness and during times of poor weather (above sea state 3) by one of two PAM operators;

- Implementation of current Greenlandic marine mammal mitigation protocols that set out appropriate responses if marine mammals approach the airguns before or during airgun firing through the use of MMSOs and PAM equipment.