STATEMENT OF REASONS

A determination on publication of a statement of reasons will be made by National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on a case-by-case basis, based on the type of decision and the potential for the decision to be of interest to multiple persons.

In the case of Bethany 3D Seismic Survey and NOPSEMA's acceptance of the proposed activity, NOPSEMA considers it appropriate to provide the statements of reasons due to:

- Specific stakeholder interest
- No apparent deterrents or restrictions on release of this information.

Providing this statement to stakeholders does not amount to an acknowledgment by NOPSEMA that the recipient is a 'person aggrieved' within the meaning in the *Administration Decisions Judicial Review Act 1977* (the ADJR Act).

This statement of reasons can be read in conjunction with the summary of the accepted environment plan, *Bethany 3D Seismic Survey Environment Plan* for this activity available on NOPSEMA's website for public disclosure.

Further information regarding appeal rights can be found in NOPSEMA's Regulatory Service Charter and the Statements of Reasons under the *Administrative Decisions (Judicial Review) Act 1997* Policy both available on NOPSEMA's website.

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STATEMENT OF REASONS

Bethany 3D Seismic Survey Environment Plan

NOPSEMA provides the following statement of reasons for its decision to accept the Bethany 3D Seismic Survey Environment Plan in accordance with regulation 10 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Relevant terms

1. In this statement, the words and phrases have the following meaning:

1.1. The Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 are referred to as the Environment Regulations.

1.2. The Bethany 3D Seismic Survey Environment Plan is referred to as the environment plan (EP).

1.3. Santos Offshore Pty Ltd is referred to as the titleholder.

1.4. The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* is referred to as the OPGGS Act.

1.5. The National Offshore Petroleum Safety and Environmental Management Authority is referred to as NOPSEMA.

1.6. The term activity or activities means a petroleum activity.

1.7. The term petroleum activity means operations or works in an offshore area undertaken for the purpose of: (a) exercising a right conferred on a petroleum titleholder under the Act by a petroleum title; or (b) discharging an obligation imposed on a petroleum titleholder by the Act or a legislative instrument under the Act.

1.8. The term environment means: (a) ecosystems and their constituent parts, including people and communities; and (b) natural and physical resources; and (c) the qualities and characteristics of locations, places and areas; and (d) the heritage value of places; and includes (e) the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).

1.9. The term environmental impact means any change to the environment, whether adverse or beneficial, that wholly or partially results from an activity.

1.10. The term control measure means a system, an item of equipment, a person or a procedure, that is used as a basis for managing environmental impacts and risks.

1.11. The term environmental management system includes the responsibilities, practices, processes and resources used to manage the environmental aspects of an activity.

1.12. The term environmental performance means the performance of a titleholder in relation to the environmental performance outcomes and standards mentioned in an environment plan.

1.13. The term relevant person has the meaning provided under regulation 11A of the Environment Regulations.

1.14. The term environmental performance outcome means a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.

1.15. The term environmental performance standard means a statement of the performance required of a control measure.

Decision

2. On 28 March 2018, NOPSEMA made the decision pursuant to regulation 10 of the Environment Regulations to accept the environment plan.

3. Acceptance of the environment plan permits the titleholder to undertake the activity described in the environment plan which is a 3D marine seismic survey in Commonwealth waters adjacent to the Northern Territory coastal waters, located within petroleum permit area NT/P85 and adjacent acreage.

4. In undertaking the activity the titleholder is subject to the requirements of the Environment Regulations and relevant provisions in the OPGGS Act.

Authority

5. Pursuant to a valid instrument of delegation dated 12 October 2017 made by Stuart Smith Chief Executive Officer of NOPSEMA as the Regulator under the Environment Regulations, the Environment Manager - Assessment and Inspection, as the delegate of the Regulator made the decision to accept the environment plan and provided notice of this decision in accordance with subregulation 11(1) of the Environment Regulations.

6. A copy of the relevant instrument of delegation is available from NOPSEMA on request.

Background

7. On 13 April 2017, the titleholder submitted an environment plan (Revision 0) to NOPSEMA in accordance with subregulation 9(1) of the environment regulation.

8. On 15 May 2017, the titleholder was notified that NOPSEMA was not reasonably satisfied that the environment plan met the criteria set out in environment regulation 10A. An opportunity to modify and resubmit an environment plan was provided to the titleholder.

9. On 19 May 2017, the titleholder resubmitted an environment plan (Revision 1) to NOPSEMA in accordance with subregulation 9(1) of the environment regulation.

10. On 8 June 2017, the titleholder was notified that NOPSEMA was not reasonably satisfied that the environment plan met the criteria set out in environment regulation 10A. An opportunity to modify and resubmit an environment plan was provided to the titleholder.

11. On 20 June 2017, the titleholder resubmitted an environment plan (Revision 2) to NOPSEMA in accordance with subregulation 9(1) of the environment regulation.

12. On 29 June 2017, the titleholder was notified that NOPSEMA was unable to make an assessment decision under subregulation 10(1 (c) of the environment regulation. Under environment regulation 9A(1) NOPSEMA requested the titleholder to provide further written

information. On 3 July 2017, the titleholder submitted further written information to NOPSEMA in the form of a revised environment plan (Revision 3).

13. On 8 July 2017, the titleholder was notified that NOPSEMA was not reasonably satisfied that the environment plan met the criteria set out in environment regulation 10A. An opportunity to modify and resubmit an environment plan was provided to the titleholder.

14. On 23 January 2018, the titleholder resubmitted an environment plan (Revision 5) to NOPSEMA in accordance with subregulation 9(1) of the environment regulation.

15. On 21 February 2018, the titleholder was notified that NOPSEMA was unable to make an assessment decision under subregulation 10(1 (c) of the environment regulation. Under environment regulation 9A(1) NOPSEMA requested the titleholder to provide further written information. On 2 March 2018, the titleholder submitted further written information to NOPSEMA.

16. On 13 March 2018, the titleholder was notified that NOPSEMA was unable to make an assessment decision under subregulation 10(1 (c) of the environment regulation. Under environment regulation 9A(1) NOPSEMA requested the titleholder to provide further written information. On 19 March 2018, the titleholder submitted further written information to NOPSEMA.

17. The acceptance was based on the document submitted as Revision 5 on 23 January 2018, including requested further written information, dated 2 March 2018 and 19 March 2018, provided in accordance with the Environment Regulations.

18. Information of which NOPSEMA was made aware, or information which was held by NOPSEMA (see below) was considered, where relevant, in conjunction with the information provided in the environment plan to make the decision.

19. On 28 March 2018 it was determined that the environment plan met the criteria set out in regulation 10A and the environment plan was accepted by NOPSEMA.

Materials considered in making the decision

20. In making this decision, NOPSEMA considered documents making up the environment plan submission in accordance with legislative requirements and NOPSEMA assessment policy and procedure.

- Bethany 3D Seismic Survey EP (Revision 5, submitted 23 January 2018)
- Further information provided by the titleholder on the 2 March 2018 and 19 March 2018 in response to NOPSEMA's request for further information
- *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
- NOPSEMA Environment Plan Assessment Policies, Guidance and Guidelines
    - PL0050 – Assessment
    - PL1347 – Environment Assessment

- GN1344 – Environment Plan Content Requirements
- GL1721 – Environment plan decision making
- IP1349 – Operational and Scientific Monitoring Programs
- IP1411 – Consultation requirements under the OPGGS Environment Regulations 2009
- IP1488 – Oil pollution risk management

Available at *https://www.nopsema.gov.au/environmental-management/environment-resources/*

- Relevant Legislative and Other Requirements
  - Department of Sustainability. Environment, Water, Population and Communities (2012). *Marine bioregional plan for the North Marine Region.*
  - Department of the Environment, Water, Heritage and the Arts (September 2008) *EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales*
  - Relevant policies, plans of management, recovery plans, conservation advice and other guidance for matters protected under the *Environmental Protection and Biodiversity Conservation Act 1999*, as well as other additional relevant scientific literature
  - Third party correspondence received by NOPSEMA on or before the date of acceptance.

Legislative framework

21. The Environment Regulations provide for:

- Subregulation 9(1) states that before commencing an activity, a titleholder must submit an environment plan for the activity to the Regulator.
- Subregulation 9A(1) states that if a titleholder submits and environment plan, the Regulator may request the titleholder to provide further written information about any matter required by these Regulations to be included in an environment plan.
- Subregulation 9A(3) states that if a titleholder receives a request, and provides information requested by the Regulator within the period specified or within a longer period agreed to by the Regulator:
  a) The information becomes part of the environment plan; and
  b) The Regulator must have regard to the information as if it has been included in the submitted environment plan.
- Paragraph 10(1)(a) states that if the Regulator is reasonably satisfied that the environment plan meets the criteria set out in regulation 10A, the Regulator must accept the environment plan.

- Paragraph 10(1)(b) states that if the Regulator is not reasonably satisfied that the environment plan meets the criteria set out in Regulation 10A, the Regulator must give the titleholder notice in writing under subregulation 10(2).
- Paragraph 10(1)(c) states that if the Regulator is unable to make a decision on the environment plan within the 30 day period, the Regulator must give the titleholder notice in writing and set out a proposed timetable for consideration of the plan.
- Subregulation 10(2) states that a notice to a titleholder under this subregulation must:
    a) State that the Regulator is not reasonably satisfied that the environment plan submitted by the titleholder meets the criteria set out in regulation 10A; and
    b) Identify the criteria set out in regulation 10A about which the Regulator is not reasonably satisfied; and
    c) Set a date by which the titleholder may resubmit the plan.
- Regulation 10A provides the criteria for acceptance of an environment plan and states that, for regulation 10, the criteria for acceptance of an environment plan are that the plan:
    a) is appropriate for the nature and scale of the activity,
    b) demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable,
    c) demonstrates that the environmental impacts and risks of the activity will be of an acceptable level,
    d) provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria,
    e) includes an appropriate implementation strategy and monitoring, recording and reporting arrangements,
    f) does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*,
    g) demonstrates that: the titleholder has carried out the consultation required by Division 2.2A; and the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultation are appropriate, and
    h) complies with the Act and regulations.

Consideration and findings of material facts

22. Following an assessment undertaken in accordance with the Environment Regulations and NOPSEMA's assessment policies and procedures NOPSEMA provides the following considerations and findings of material fact which contributed to the decision to accept the environment plan.

Environmental Assessment – Description of the activity

22.1. NOPSEMA considered the description of the activity and found that:

- a comprehensive description of the activity had been provided in the environment plan which was relevant for the consideration of environmental impacts and risks of the activity, such as:
    - The petroleum activity described in the environment plan is a marine seismic survey in Commonwealth waters approximately 70 km North West of Melville Island (the closest emergent land) and north of Bathurst Island in the Northern Territory.
    - The activity will be undertaken using a purpose-built survey vessel equipped with the necessary hardware to conduct a seismic acquisition survey. The seismic equipment will consist of up to 12 solid streamers, each with a length of 6,000 metres. Each array has a volume of up to 2,380 cubic inches and an operating pressure of ~2000psi.
    - Diagrams, figures and coordinates depicting the survey operational area (~12,610 km2) and acquisition area (full power zone ~4,565 km2)
- information considered relevant for the consideration of environmental impacts and risks (such as the operational details of the activity and proposed timetable) included:
    - a statement in the EP that the survey is planned to occur within the period 1 May to 30 September 2018 or 2019, excluding the period of 31 August to 15 September 2018 during Department of Defence "Exercise Kakadu".
    - the activity duration, which is a maximum of 75 days,
    - hours of operation, which is 24 hours a day,
    - the activity location, which is within NT/P85 and NT/P82 and associated adjacent acreage – offshore Boneparte Basin (approximately 250 km from Darwin,
    - water depths of the activity location, which range from 20m to 202m,
    - A triple source array will be towed at 6 m (+/- 1 m). The total volume of each airgun array is 2380in^3 from a single source,
    - airgun operating pressure, which is ~2000psi,
    - source interval, which is 12.5m,
    - hydrophone type, length and depth, which is 12 solid hydrophone streamers towed 100m apart, 6km long and towed between 15 and 20m depth,
    - general details of the vessels to be used for the activity, and
    - confirmation that the activity or any part of the activity will not be undertaken in any part of a declared World Heritage property within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

Environmental Assessment – Description of the environment

22.2. NOPSEMA considered the description of the environment that may be affected by the activity including relevant values and sensitivities and found that:

- the description includes the physical environment features and biological ecosystems and their constituent parts in the area that may be affected by the activity, including under emergency conditions,
- 18 listed threatened and 32 listed migratory species within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999,* including 24 species of cetaceans, have been identified and described,
- values and sensitivities of the Northwest Shelf Transition Province and Timor Transition Province Commonwealth marine areas have been identified and described,
- values and sensitivities of the Oceanic Shoals Marine Park (OSMP) Multiple Use Zone IUCN VI, including the key ecological features (KEF): Carbonate bank and terrace system of the Van Diemen Rise; Pinnacles of the Bonaparte Basin; and Shelf Break and slope of the Arafura Shelf, have been identified and described,
- in identifying relevant values and sensitivities, the environment plan has had regard to the Marine bioregional plan for the North Marine Region,
- Commonwealth and Northern Territory (NT) managed commercial fisheries including the Commonwealth Northern Prawn Fishery and NT fisheries; Timor Reef Fishery, Demersal Fishery, Pearl Oyster Fishery, Spanish Mackerel Fishery, Offshore Net and Line Fishery, and Aquarium Fishery have been identified and described, and
- social, economic and cultural features of the environment relating to defence areas, recreational activities including fishing, commercial shipping and other petroleum activities, have been identified and described.

Environmental Assessment – Requirements

22.3. NOPSEMA considered the environment plan's description of requirements, including legislative requirements that apply to the activity and are relevant to the environmental management of the activity and found that:

- a suitable description of the relevant legislative and other requirements applying to the activity, including relevant plans of management under the *Environment Protection and Biodiversity Conservation Act 1999* has been provided in the environment plan, and
- a suitable demonstration of how these requirements will be met by the titleholder has been provided by integrating these requirements as criteria for demonstrating that impacts and risks of the activity will be of an acceptable level.

Environmental Assessment – Evaluation of environmental impacts and risks

22.4. NOPSEMA considered the details of the environmental impacts and risks for the activity and found that:

- a sufficiently robust method consistent with internationally recognised standards, AS/NZS ISO 31000: Risk management - Principles and guidelines and AS/NZS ISO 14001: Environmental management systems, has been applied for the identification and evaluation of environmental impacts and risks of the activity. This included establishing the

internal and external context, defining criteria for evaluation, identifying and analysing impacts and risks, conducting an evaluation and application of control measures.

- All environmental impacts and risks detailed as resulting from all aspects of the activity are appropriately identified, given the description of the activity and environment that may be affected by the activity.
- These include impacts and risks associated with:
    - Seismic underwater noise;
    - Vessel and helicopter noise;
    - Light emissions;
    - Atmospheric emissions;
    - Wastewater discharges (sewage, grey water, deck drainage bilge water, cooling water and brine);
    - Waste (Hazardous / Non-hazardous);
    - Seabed disturbance (dropped objects, loss of equipment and unplanned anchoring);
    - Fauna interactions (collision or entanglement)
    - Marine users interactions (Interference with / exclusion of other users of the sea);
    - Introduction of marine pests from vessel hull or ballast water discharge;
    - Accidental release of hazardous chemicals and liquid wastes (excluding fuel); and
    - Accidental hydrocarbon spill from refuelling or vessel collision.

22.5. NOPSEMA considered the evaluation of environmental impacts and risks and found that this was appropriate to the nature and scale of each impact and risk given:

- a sufficiently robust method has been applied for the demonstration that each environmental impact and risk of the activity will be reduced to as low as reasonably practicable, and the implementation of additional control measures would be grossly disproportionate to benefit gained, by evaluating all against one or a combination of the following criteria;
    - hierarchy of controls;
    - decision making criteria considering type of activity, risk and uncertainty and stakeholder influence;
    - comparison with good practice control measures, engineering risk assessment and precautionary approach;
    - comparative options assessment of risks, costs and benefits; and
    - titleholder's risk assessment process.
- a sufficiently robust method has been applied for the demonstration that each environmental impact and risk of the activity will be of an acceptable level by evaluating all against the following criteria;
    - Santos Offshore Environment Health and Safety Policy and standards;
    - all relevant Commonwealth legislation and industry best practice guidance;
    - Principles of Ecologically Sustainable Development;

- Consistency with relevant plans of management and policy statements developed under the *Environment Protection and Biodiversity Conservation Act 1999* and IUCN Reserve Management Principles;
- stakeholder influence and expectations; and
- demonstrating that impacts and risks have been reduced to ALARP.

- the evaluation considered the likelihood and consequence of all impacts and risks using a consistent method before and after implementation of control measures.
- the statements and conclusions drawn by the titleholder regarding impacts and risks have been sufficiently supported with scientific literature, with greater effort placed supporting the evaluation where there is a higher degree of uncertainty and higher potential consequences. Supporting detail includes the use of underwater acoustic modelling to predict received levels in the marine environment and the use of maximum credible spill scenario modelling to predict the extent of spill.

22.6. The environment plan has demonstrated that the impacts and risks to fish will be reduced to an acceptable and as low as reasonably practicable level for the following reasons:

- Underwater acoustic modelling specific to the survey area and the proposed airgun array was performed to: predict peak sound levels at both the source (1 m from airgun array), maximum received sound levels at various ranges from the source, and accumulated sound exposure over 24 hours. The modelling methodology and modelling inputs were considered appropriate for the activity.
- Results of this modelling were used to inform the prediction of environmental impacts from the activity, including through the interrogation of model outputs against acoustic impact thresholds/criteria for mortality and potential mortal injury, recoverable injury and temporary threshold shift (TTS), and behavioural effects. The thresholds/criteria selected were appropriately supported by a review of published peer reviewed scientific literature.
- The environment plan appropriately uses predictions of received sound levels in the environment and a comparison with selected effect thresholds to evaluate the potential impacts of the activity on pelagic, demersal and site-attached fish that may be exposed to acoustic emissions.
- The effect range for mortality or potential mortal injury to fish was estimated for all fish on the assumption they are hearing specialists; a conservative assumption. On this basis mortality or potential mortal injury to fish is not predicted to occur at distances >165 m from the acoustic source array and cumulative sound levels are not predicted to cause temporary hearing loss to fish at distances >3.4 km from the source array.
- The environment plan has made calculations of the proportion of key relevant fish habitat/fishery areas that may be exposed to sound levels predicted to cause potential mortal injury. For these predictions, the environment plan has conservatively assumed that site attached fish as well as mobile demersal and pelagic fish will not avoid the approaching airgun array.
- The environment plan predicts:
  - that 22.5% of the acquisition area may support site attached fish assemblages based on benthic habitat modelling. The area of site-attached fish habitat subject

to mortality or potential mortal injury effects equates to <1% of the Oceanic Shoals Marine Park, and <2% of the Carbonate bank and terrace system of the Van Diemen Rise KEF.

- that the area of mobile demersal or pelagic fish habitat subject to mortality or potential mortal injury effects equates to a total of 3.5% of the Oceanic Shoals Marine Park and 8% of the Carbonate bank and terrace system of the Van Diemen Rise KEF. From catch data provided by Northern Territory Department of Primary Industry and Resources (NT DPIR), this equates to an area where 0.01% of the Demersal Fishery's catch is taken and 4.3% of where the Timor Reef Fishery's catch is taken.
- The area of fish habitat exposed to sound levels that may result in temporary threshold shift (TTS) in hearing effects to pelagic, demersal and site-attached fish equates to an area where 0.03% of the Demersal Fishery's catch is taken and 7.8% of where the Timor Reef Fishery's catch is taken, <9% of the Oceanic Shoals Marine Park and <20% of the Carbonate bank and terrace system of the Van Diemen Rise KEF.

- The predictions of the extent of TTS, injury and mortality effects in fish are considered conservative given that the distribution of mobile demersal and pelagic fish will not be uniform over these areas and based on current scientific understanding as outlined in the EP. At least some fish in the area affected are likely to undertake avoidance behaviour in response to noise before receiving levels that will cause injury or mortality. Further, from a review of scientific literature in the environment plan, no studies to date have demonstrated direct mortality of adult fish in response to airgun emissions, even when fired at close proximity.
- Even if localised mortality to fish was to occur in the acquisition area, it is not expected to result in long term impacts to populations and recovery would be assisted by local recruitment from adjacent habitats. The environment plan has cited a range of relevant scientific literature which identifies that coral reef fish assemblages are able to respond rapidly to large-scale natural and anthropogenic change in the absence of habitat damage. This includes the ability to recolonize populations of larger fished species from adjacent areas and recruitment of less mobile species through planktonic distribution and settlement. The environment plan describes high species diversity across the acquisition area and an abundance of similar habitat in the surrounding Oceanic Shoals Marine Park and Carbonate bank and terrace system of the Van Diemen Rise KEF.
- The conservative predictions of impact to fish outlined above are used as the basis for demonstrating acceptable levels of impact. The EP makes a well-reasoned case that mortality impacts to less than 5% of the fish habitats within Oceanic Shoals Marine Park and Carbonate bank and terrace system of the Van Diemen Rise KEF is an acceptable level of impact for fish. For effects on fished species, the EP acknowledges that the catchability of fished species for commercial licence holders may be affected and has defined an appropriate acceptable level of impact to fished species as "Commercial fishing licence holders are no worse or better off as a result of the survey". This is considered appropriate in light of the controls proposed to be implemented by the titleholder.
- An independent expert peer review of temporary and recoverable hearing loss in fish attributed to the activity was commissioned by the titleholder in response to concerns

raised by relevant persons and was considered during the assessment (Popper, 2018). This confirmed that the acoustic modelling undertaken by the titleholder, sound exposure assumptions, impact threshold criteria and extent of predicted impact presented in the environment plan was suitably conservative and appropriate for the proposed activity.

- Popper (2018) concluded that the most likely effect on fish in the acquisition area is TTS and as most fish in the survey area do not have hearing specializations, fish are not likely to have much (if any) TTS as a result of the survey. If TTS is experienced, the level would be low and recovery would start as soon as the most intense sound ends and would be within 24 hours. This supports the conclusion that the evaluation of TTS effects in fish in the environment plan is conservative and that any TTS effects that are realised in fish will be temporary and likely to recover within 24 hours. In addition, Popper concluded that it is highly unlikely that there would be physical damage to fish as a result of the survey unless the animals are very close to the source (within a few meters).
- The environment plan follows a very precautionary approach to addressing scientific uncertainty associated with predicting potential impacts to fish following exposure to sound. A very conservative estimate of the proportion of fish assemblages within the acquisition area that could incur mortality, physical injury or TTS effects is provided and this is used as the basis for selecting appropriate control measures and demonstrating acceptable levels of impact.
- The environment plan has included well supported and reasoned arguments for the inclusion and exclusion of controls to prevent, mitigate and manage impacts on fish from noise. Controls being implemented include timing the survey to avoid key fished species spawning periods, using the smallest seismic source possible, undertaking soft start procedures and restricting infill activities.

22.7. The environment plan has demonstrated that impacts and risks to matters protected under Part 3 of the EPBC Act will be reduced to an acceptable and as low as reasonably practicable level for the following reasoning:

- The survey area overlaps matters protected under Part 3 of the EPBC Act which include the Oceanic Shoals Marine Park and marine fauna such as cetaceans, turtles and whale sharks.
- While one foraging biologically important area for the olive ridley turtle (year round) is overlapped, the activity does not overlap with any habitat critical to survival of any listed threatened or migratory species.
- The acquisition area also overlaps the Carbonate bank and terrace system of the Van Diemen Rise key ecological feature.
- With respect to managing potential noise impacts on marine fauna, the activity will be undertaken in a manner that is consistent with the:
    - Conservation Advice for *Megaptera novaeangliae* (humpback whale);
    - Recovery Plan for Marine Turtles in Australia (2017 – 2027); and,
    - Whale Shark (*Rhinocodon typus*) Recovery Plan (2005-2010).
- Given protected marine fauna may be present in the survey area, all aspects of Policy Statement 2.1 Part A and specified aspects of Part B will be implemented to mitigate potential noise impacts. This includes (though is not limited to) a 500m shut down zone, increased low power zone (2 km) and having two qualified marine mammal observers.

- The underwater acoustic modelling results support the justification that proposed mitigation zones will be effective in preventing physical injury to cetaceans, turtles and whale sharks should they be present in the operational area during the survey.
- Through the application of appropriate assumptions the titleholder's impact assessment has a level of precaution consistent with the principles of ecologically sustainable development in the presence of scientific uncertainty.
- The environment plan has demonstrated that potential impacts from acoustic emissions on habitats within the Oceanic Shoals Marine Park and the Carbonate bank and terrace system of the Van Diemen Rise will be managed in a manner that is consistent with the IUCN principles for a Multiple Use Zone - IUCN Category VI marine reserve.
- The temporal and spatial restrictions of the survey in conjunction with the control measures for sound mitigation are appropriate to the nature and scale of the activity.
- The environment plan has demonstrated that the consequence of any potential impacts to protected matters are likely to be limited to short term, recoverable disturbance within the operational area and is in compliance with relevant plans of management and Australian IUCN Principles.

22.8. The environment plan has demonstrated that impacts and risks from displacement of commercial fisheries will be reduced to an acceptable and as low as reasonably level for the following reasoning:

- The environment plan recognises that the activity area overlaps with areas that are utilised for commercial fishing activities, notably the Timor Reef Fishery and Demersal Fishery, Northern Prawn Fishery and areas historically fished for Pearl Oyster.
- The titleholder has undertaken extensive consultation with relevant persons with functions, interests or activities relevant to commercial fishing. This includes fisheries management authorities; the Northern Territory Department of Primary Industry and Resources (DPIR), and The Australian Fisheries Management Authority; fisheries peak bodies including the Northern Territory Seafood Council, The Northern Prawn Fishery Industry; fisheries representatives and individual fisheries licence holders.
- Information obtained from consultation including fishing effort and historical catch in the activity area has been used to inform the assessment of potential impacts to fishing operations from the activity. This assessment identifies that for most fisheries, impacts are predicted to be unlikely, short term and localised.
- In relation to the Timor Reef Fishery, based on information provided by NT DPIR only a small proportion of annual catch made by the Fishery comes from the area overlapped by the proposed activity.
- There are two Timor Reef Fishery licensees with a recent history of operating in the survey area; one has recently used trawling as part of a trial, and the other has used trap and line. The Timor Reef Fishery does not have a closed season and consultation with the licensees indicate that they operate all year round.
- During the 75 days of the proposed activity a safety exclusion zone will be in effect around the survey vessel and streamers. This may mean that fishing activity by the licensees will be restricted intermittently as the seismic vessel works across the survey area. The titleholder has identified that this may require fishers to relocate their fishing operations and that this represents a potential for a localised and medium term impact to their operations.

- The titleholder has evaluated practicable controls to reduce interaction with fishing operations to as low as reasonably practicable. As a result, a range of control measures including maintenance of at sea communication protocols and the issue notifications will be implemented. In addition, the titleholder will be adopting a measure to provide a loss of catch payment to any fishers to ensure that fishers are no worse or better off as a result of the survey.
- The compensation model was developed with input from relevant fisheries. The model was reviewed by an independent fisheries economist who confirmed the model is generally consistent with international best practice.
- Given the temporal and spatial limitations of the activity, the controls adopted to manage interactions between fishing and seismic vessels, and loss of catch payment, it has been demonstrated that any impacts and risks from vessel interactions would be of an acceptable level.

22.9. The environment plan has demonstrated that impacts and risks on commercial fishery stocks will be reduced to an acceptable and as low as reasonably practicable level for the following reasoning:

- The activity has been timed to avoid peak spawning periods for fish species targeted by the Timor Reef Fishery, and for the Pearl Oyster. The environment plan has identified that the acquisition area of the activity is outside the area where commercial prawn species spawn.
- As discussed in section 22.6, predictive acoustic modelling was undertaken by the titleholder and the results compared against thresholds/criteria derived from published peer reviewed scientific literature.
- This information was then used to estimate the percentage of area overlap with actively fished areas in relation to: mortality or potential mortal injury, and temporary and recoverable hearing loss to individual and populations of target species.
- The area of potential physiological impact to commercially targeted prawns is expected to be restricted to a maximum of 0.6% of the Northern Prawn Fishery. This is a conservative prediction given the conservative thresholds applied; the small area of survey overlap with historical fishing areas; and avoidance of sensitive periods where juvenile prawns may be present.
- The acquisition area overlaps 11% of the Pearl Oyster Managed Fishery, however fishing efforts are restricted to water depths less than 35 m and this equates to 3.6% of the entire acquisition area. The environment plan predicts that potential physiological impacts to commercially targeted pearl oysters may occur within the overlapped area of the fishery. However, most of the harvesting activity is located south of the acquisition area and NT DPIR has advised that no fishing has occurred in this area since 2008. The prediction of impacts assumes an even distribution of pearl oysters in the acquisition area and that all oysters will be affected above the thresholds applied.
- The environment plan has conservatively determined the effect range for mortality or potential mortal injury to fish under the assumption that all fish are hearing specialists and that mobile demersal and pelagic fish will not avoid the approaching airgun array. As a result, the environment plan predicts that mortality or potential mortal injury to fish may

occur within an area equating to where 0.01% of the Demersal Fishery's catch is taken and 4.3% of where the Timor Reef Fishery's catch is taken.

- If temporary threshold shift (TTS) effects to pelagic, demersal and site-attached fish did occur, the area exposed will be limited to a small percentage of the Timor Reef Fishery. This is an area where in recent years an average of 7.8% of the total Timor Reef Fishery catch has been made. This is further explained in 22.6.
- It is apparent from the consultation that some representatives of the Timor Reef Fishery licensees do not agree with the evaluation of impact to fish stock provided in the environment plan given their objections and claims.
- In response to concerns regarding the survey, the Northern Territory Seafood Council (NTSC) commissioned an acoustic modelling report from CMST to predict cumulative sound exposure levels from theoretical seismic survey scenarios. The modelling report was provided to NOPSEMA by NTSC and was subsequently provided to the titleholder as information relevant to the environment plan and NOPSEMA's assessment.
- The alternative modelling scenarios in the CMST modelling report were not directly comparable with the survey parameters for the proposed activity. However, it was still considered to support the modelling report prepared by the titleholder in that sound exposure at levels above thresholds that may cause TTS were predicted to occur throughout the survey area.
- The titleholder considered the modelling as well as the associated objections and claims made by NTSC and concluded that the CMST modelling was consistent with their assessment. An appropriate assessment and response was given to each of the objections and claims made.
- The titleholder has undertaken appropriate consultation with these licensees, and sought independent advice from an internationally recognised independent expert on fish hearing and bioacoustics (Popper, 2018). This has provided useful context in addressing relevant person objections and claims.
- In relation to these objections and claims, a suitable scientific case has been made that predicted impacts to target commercial fishery species is likely to be limited to short term disturbance.
- Given the evaluation provided, temporal and spatial limitations of the activity, control measures to mitigate effects from the activity, predicted impacts and risks from sound emissions to commercial fisheries stocks have been demonstrated to be an acceptable level and reduced to as low as reasonably practicable.

22.10. NOPSEMA considered the details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and acceptable levels and found that:

- control measures in the form of systems, equipment, persons and procedures have been clearly identified,
- these control measures will be appropriate for managing each of the environmental impacts and risks of the activity, given a clear demonstration has been provided by the titleholder through application of the above method of risk analysis, treatment and evaluation, and

- the control measures applied will be effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and acceptable levels.

Environmental Assessment – Environmental performance outcomes and standards

22.11. NOPSEMA considered the environmental performance outcomes, environmental performance standards and measurement criteria and found that:

- environmental performance standards have been appropriately set for control measures identified as being necessary to reduce the environmental impacts and risks of the activity to as low as reasonably practicable and acceptable levels,
- environmental performance outcomes have been appropriately set to provide measurable levels of performance for the management of the environmental aspects of the activity to ensure that environmental impacts and risks of the activity will be of an acceptable level, and
- measurement criteria provided will allow the titleholder to determine whether each environmental performance outcome and environmental performance standard is being met for the duration of the activity.

Implementation strategy for the environment plan

22.12. NOPSEMA considered the implementation strategy for the activity including monitoring, recording and reporting arrangements and found that:

- the plan includes suitable arrangements for reporting the titleholder's environmental performance of the activity to NOPSEMA,
- the environmental management system described is consistent with recognised standards, AS/NZS ISO 14001: Environmental management systems, AS/NZS ISO 31000: Risk management - Principles and guidelines and contains specific measures to ensure that the control measures detailed in the environment plan will be effective in reducing the environmental impacts and risks of the activity to an acceptable level and as low as reasonably practicable; and that the environmental performance outcomes and standards in the environment plan will be met,
- the environment management system includes measures to ensure that environmental impacts and risks of the activity will continue to be identified and reduced to as low as reasonably practicable and to an acceptable level. Specifically, periodic review of environmental inputs used to inform the evaluation of impacts and risks, including updates to legislative requirements, and environmental information will be performed. A clearly described and proposed management of change process is to be used to document and assess any change.
- a clear chain of command is established in the environment plan, with set roles and responsibilities of personnel in relation to the implementation, management and review of the environment plan, including during emergencies or potential emergencies, with the titleholder responsible for ensuring the activity is undertaken in the manner described in the environment plan,

- there are suitable measures in place to ensure that each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training, in particular, those with specialist roles such as Marine Mammal Observers,
- sufficient arrangements are in place for monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and standards in the environment plan are being met,
- sufficient arrangements are in place to allow monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met,
- an oil pollution emergency plan has been provided that is consistent with the national system for oil pollution preparedness and response and includes arrangements for responding to and monitoring oil pollution, including: the control measures necessary for timely response to an emergency; the arrangements and capability in place, for the duration of the activity, to ensure timely implementation of the control measures, including arrangements for ongoing maintenance of response capability; the arrangements and capability in place for monitoring the effectiveness of the control measures and ensuring that the environmental performance standards for the control measures are met; and arrangements and capability for monitoring oil pollution to inform response activities are in place,
- arrangements for testing of the response arrangements in the oil pollution emergency plan include a pre-survey campaign specific oil pollution emergency drill that will be appropriate given the response arrangements and nature and scale of the risk of oil pollution for the activity,
- monitoring of impacts to the environment from oil pollution and response activities has been provided for, that is appropriate to the nature and scale of the risk for the activity and will be sufficient to inform any remediation activities, and
- appropriate ongoing consultation arrangements are in place with relevant authorities of the Commonwealth, Northern Territory, fishers and other relevant interested persons or organisations. The titleholder has developed a communication and engagement strategy requiring ongoing identification of new relevant persons, considering and responding to new objections and claims and keeping relevant persons informed of the activity. This occurs through a number of mechanisms including a 2 week pre-start notification, daily report (if requested) and in the event there are any environmentally relevant changes to the activity that require consultation.

Details of titleholder and liaison person

22.13. NOPSEMA considered the details of the titleholder and liaison person provided in the environment plan and found:

- that details of the titleholder's name (Santos Offshore Pty Ltd), business address and ACN (within the meaning of the *Corporations Act 2001*) and the titleholder's nominated liaison person, their business address, telephone number and email met requirements, and
- there were suitable arrangements provided for notifying the Regulator of a change in the titleholder, the nominated liaison person, or of change in the contact details of either the titleholder or the liaison person.

Other information in the environment plan

22.14. NOPSEMA considered other information provided in the environment plan and found that:

- the titleholder's "Environment, Health and Safety Policy" was provided, and
- details of all reportable incidents, meaning those that have the potential to cause moderate to significant environmental damage relating to the activity, are to be reported to NOPSEMA?.

Consultation undertaken in the course of preparing the environment plan

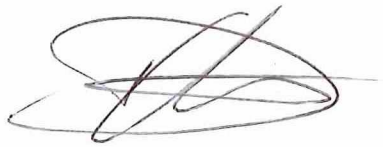
22.15. NOPSEMA considered the consultation that the titleholder has carried out as required by Division 2.2A and the measures that the titleholder has adopted, or proposes to adopt because of the consultations and found that:

- in preparing the environment plan, the titleholder consulted with each of the following (a relevant person):
    - each Department or agency of the Commonwealth, to which the activities to be carried out under the environment plan, may be relevant,
    - each Department of agency of the Northern Territory, to which the activities to be carried out under the environment plan, may be relevant,
    - each person or organisation whose function, interests or activities may be affected by the activities to be carried out under the environment plan, and
    - other persons and organisations that the titleholder considered relevant.
- the titleholder has demonstrated that each relevant person has been provided with sufficient information and a reasonable period to make an informed assessment of the possible consequences of the activity on the functions, interest or activities of the relevant person, given:
    - Information gathered from consultation has been used to inform the preparation of the environment plan.
    - The consultation records provided confirm that relevant persons have been kept informed of new developments and changes in elements of the environment plan relevant to their functions, interests and activities.

  - As part of consultation, the titleholder has provided sufficient information to relevant persons to allow them to make an informed assessment of the possible consequences of the activity on their functions, interests or activities (including any subsequent changes). In some cases providing a copy of the entire environment plan.
  - Sufficient time has been given to relevant persons for them to make an informed assessment of the possible consequences of the activity on their functions, interests or activities. In particular, the titleholder provided initial information about the proposed activity in the form of correspondence to relevant persons in mid-2015 and during 2016. Consultation continued throughout 2017 and 2018.
  - The titleholder has adopted a methodical approach to the identification of relevant persons, formulation of a consultation strategy, and maintenance of consultation records.
- the report provided by the titleholder on consultation undertaken in the course of preparing the environment plan is appropriate as it includes:
  - a summary of each response made a by a relevant person,
  - an assessment of the merits of any objection or claim about adverse impact of each activity to which the environment plan relates,
  - a statement of the titleholder's response, if any, to each objection or claim, and
  - a copy of the full text of any response by a relevant person.
- the objections and claims raised by relevant persons and assessed by the titleholder relate to:
  - displacement to commercial and recreational fishing activities,
  - impacts to commercial shipping / other marine users,
  - impacts to commercial and recreational fish species and fish stocks,
  - impacts to commercial and recreational fisheries,
  - impacts to marine fauna,
  - management of waste and oil spills
  - management measures,
  - consultation.
- Objections and claims have been sufficiently addressed by the titleholder. Due consideration has been given to each objection and claim made by relevant persons. This includes engagement of an independent acoustic impact expert (Popper, 2018) to consider objections and claims made by a relevant person regarding temporary and recoverable hearing loss in fish attributed to the activity.
- Appropriate responses have been provided to relevant persons in a timely manner for each objection and claim made.

- The consultation undertaken has met the requirements of Division 2.2A and the titleholder has adopted appropriate measures to reduce impacts and risks to an acceptable level.

22.16. NOPSEMA considered the environment plan and found that it complies with the Environment Regulations and the relevant requirements of the OPGGS Act.



David Christensen

Environment Manager, Assessment and Inspection

29 March 2018