ENVIRONMENT PLAN SUMMARY – VESTA 1&2 WELL HEAD ABANDONMENT

				Keith Cook 2017.06.20 15:43:12 +08'00'	Tom Coolican 2017.06.20 17:26:53 +09'30'			
	01	20/06/17	Final Issue	KCO	TCO	EDE		
	00	08/06/17	Final Issue	KCO	TCO	EDE		
Validity Status / Rev. Number / Revision index		Date	Description	Prepared by	Checked by	Approved by	Contractor Approval	Company Approval

eni australia	Project name **VESTA 1&2 WELL HEAD ABANDONMENT**	Company identification ACP21_HSE_R_WE.0005 Job N. ___
		Contractor identification Contract ___
(Vendor logo and business name)		Vendor identification ..... Order N.....

Facility Name	Location	Scale	Total No.of Pages
VESTA 1&2	AUSTRALIA	1:1	1/33

Document Title	Supersedes N.....	
ENVIRONMENT PLAN SUMMARY – VESTA 1&2 WELL HEAD ABANDONMENT	Superseded by N.....	
	Plant Area	Plant Unit

REVISION HISTORY

Rev.	Date	Nr. of sheets	Description
00	08/06/17	32	Final Issue
01	20/06/17	33	Revised based on NOPSEMA guidance Final Issue

TABLE OF CONTENTS

TABLES

FIGURES

1. INTRODUCTION

The AC/P 21 Permit Area is in Commonwealth waters off the north western Australian coast, about 151 km to the east of Ashmore Reef and Cartier Island and approximately 687 km west-northwest of Darwin (Figure 2.1).

Eni Australia Limited (Eni) is the Operator of the AC/P 21 Permit Area and the Titleholder as defined under the Offshore Petroleum & Greenhouse Gas (Environment) Regulations 2009 (OPGGS(E) Regulations). Eni operates on behalf of the Joint Venture, which comprises:

- Eni – Operator, 40%
- SIPIC Australia Pty Ltd – 30%
- OPIC Australia Pty Ltd - 30%

Vesta-1 and Vesta-2 (Vesta-1 & 2) wells were drilled by Eni as part of exploration activity in Permit Area AC/P 21 in 2005 and 2007 respectively. Following drilling and associated testing, the two wells were plugged and abandoned (P&A) with the well heads left in place. P&A of the wells was undertaken in accordance with an approved Well Operations Management Plan (WOMP) and, following submission of an End of Well Abandonment Report (EOWAR) in 2016, was accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) as meeting the requirements for permanent abandonment, consistent with regulation 5.17(c) of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

The two wells are located in slightly over 100 metres (m) of water depth, with the well heads originally extending approximately 3-4m above the surrounding seabed. The wells have remained undisturbed since the original drilling campaigns and Eni intends to leave (abandon) the well heads in situ permanently (in perpetuity).

An Environment Plan (EP) for permanent abandonment of the Vesta-1 & 2 well heads was prepared in accordance with the requirements of the OPGGS (E) Regulations. The EP was reviewed and accepted by NOPSEMA on 30 May 2017. This EP summary document has been prepared and submitted to NOPSEMA in accordance with Regulation 11(7) of the OPGGS(E) Regulations.

2. LOCATION OF ACTIVITY

The Vesta-1 & 2 well heads are located in AC/P 21 Permit Area, in Commonwealth waters off the north western Australian coast, about 151 km to the east of Ashmore Reef and Cartier Island and approximately 687 km west-northwest of Darwin.

The water depth at the well sites are approximately 105m. The location of the Vesta-1 & 2 well heads, including the geographical coordinates of each well head, boundaries of the Permit Area, regional bathymetry and proximity to coastline and landmarks, is shown on Figure 2.1.

A schematic of the well heads is provided in Figure 2.2 and Figure 2.3. The well heads comprise a cement 'collar', protruding steel pipe (casing) and associated steel casing hangers and cap. At the time of drilling, the entire well head structure extended approximately 3-4m high above the surrounding seabed. At its widest, the Vesta-1 structure has a diameter of less than 2m. The Vesta-2 well head includes 4 Xmas Tree guidebars (carbon steel), which extend approximately 2m horizontally from the centre of the well (Figure 2.3).

Given that the Vesta-1 & 2 well heads have remained undisturbed on the seafloor for an extended period (over 12 and 9 years respectively) it is anticipated that they would now be covered in marine growth.

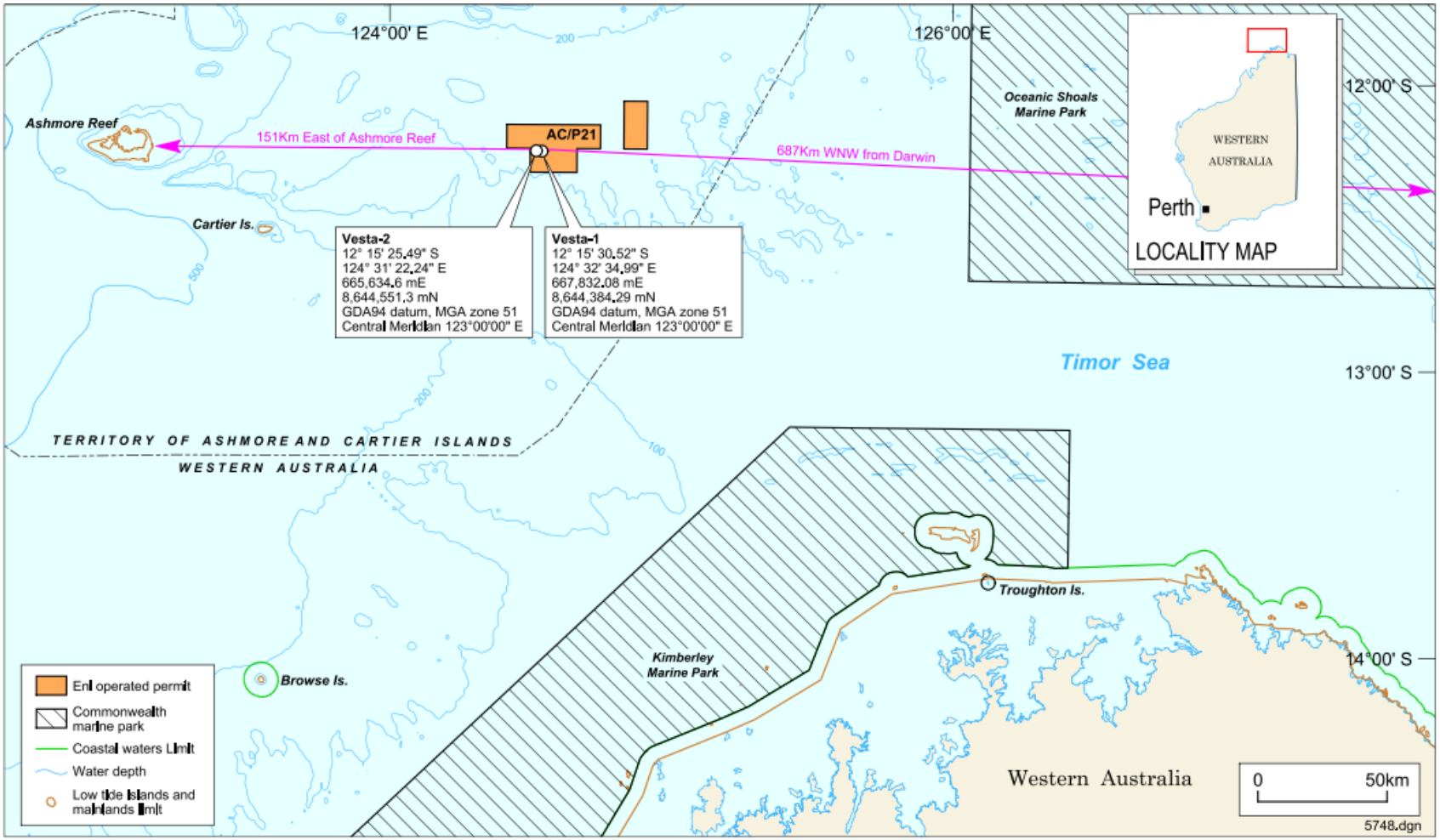

Figure 2.1: Location Map

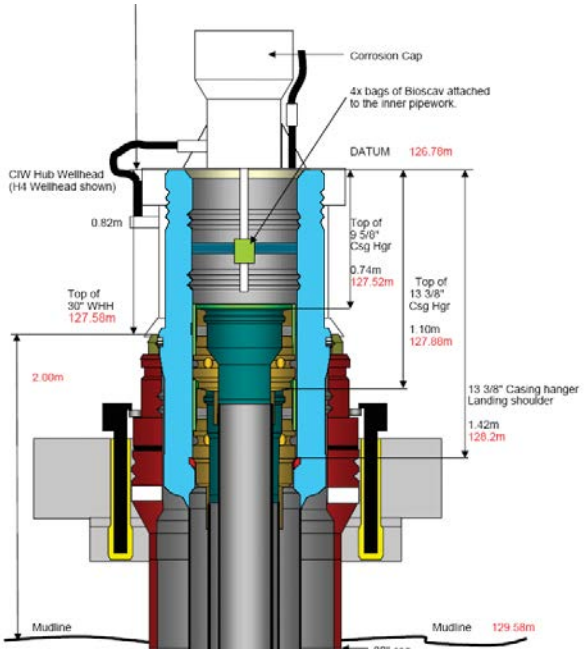

Figure 2.2: Vesta-1 Well Head Schematic

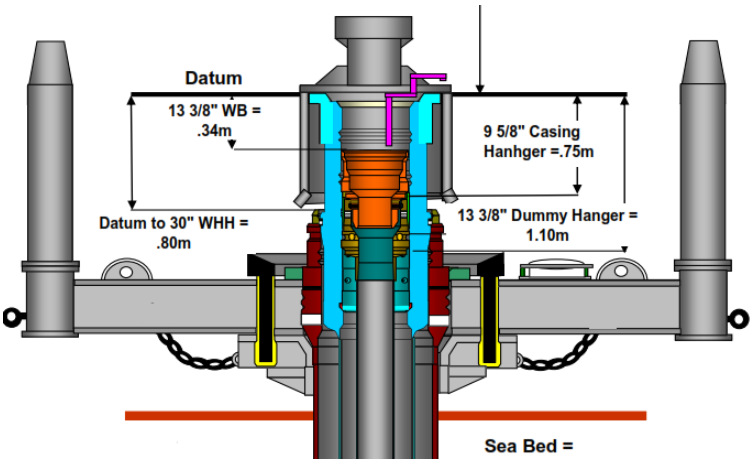

Figure 2.3: Vesta-2 Well Head Schematic

3. DESCRIPTION OF ACTIVITY

The Activity involves permanent (in perpetuity) abandonment of the Vesta-1 & 2 wells. As the ongoing integrity of the wells has been assured by the previous WOMP activities, no further onsite operations are proposed and the wells, including well heads, will be passively abandoned in situ.

Eni plans to continue evaluations of the prospectivity in the Permit Area.

4. DESCRIPTION OF RECEIVING ENVIRONMENT

There are no credible oil spill risks associated with the proposed Activity (Section 5). Consequently, the environment that may be affected (EMBA) is limited to the zone immediately surrounding (ie within 200m of) the well heads, which falls entirely within Permit Area AC/P 21.

4.1 Physical Environment

Permit Area AC/P 21 lies on the continental shelf within the North-west Marine Region, which covers almost 1.07 million square kilometres (Commonwealth of Australia, 2012) and includes Commonwealth waters on the North West Shelf. By far the majority of the shelf (including the Permit Area) is comprised of deep waters (>100 m) overlying fine clay sediments or carbonate sands (Heyward et al. 1997).

The Vesta-1 & 2 wells are located in deep water (>100m) on the continental shelf within the Vulcan Sub-basin in the Timor Sea. The Vulcan Sub-basin comprises a complex series of horsts, graben and marginal terraces (RET 2010). Habitat complexity and species richness are variable (DEWHA 2008). In the permit area, the seabed is generally flat.

4.2 Biological Environment

The EMBA does not contain any particular benthic sensitivities or benthic conservation values, is not recognised critical habitat for any *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed species and reflects the environment at similar depths and distance offshore over broad expanses in the region.

Across the northern continental shelf, the predominant animals living within seabed sediments (infauna) are polychaetes (burrowing worms) and crustaceans (eg. prawns, shrimp, crabs). These two groups comprise 84% of the total species in sediment samples with a high diversity of species but a low abundance of each individual species (Heyward et al. 1997). The remaining 16% of species include echinoderms (eg. sea stars, sea urchins, feather stars), molluscs (both gastropods and bivalves), nemerteans (ribbon worms), sponges and fish.

Epibenthic communities (animals living on the seabed) in deeper waters are generally depauperate (low in fauna abundance and diversity). Heyward et al. (1997) noted that with little sea floor topography and hard substrate, such areas offered minimal habitat diversity or niches for animals to occupy. The main taxa found in these areas include sponges and gorgonians (sea whips and sea fans). The absence of hard substrate is considered a limiting factor for the recruitment of epibenthic organisms (Heyward and Smith 1996).

Sampling by consultants (CEE 2001) in the Permit Area found that the seabed was characterised by flat, white sediments with a sparse fauna of brittle stars, hermit crabs, solitary corals and holothuroids (sea cucumbers). Infauna were also sparse, comprising polychaetes, brittle stars and small crustaceans.

4.3 Values and Sensitivities

Key ecological features (KEFs) and other recognised values and sensitivities of the marine environment in the region of the Permit Area are shown in Figure 4.1. Marine protected areas in the region of the Permit Area are shown on Figure 4.2.

The EMBA does not contain or intersect any:

- World Heritage Areas
- National Heritage Places
- Wetlands of international or national importance
- Commonwealth Marine Reserves or conservation zones
- State Marine Protected Areas
- KEFs
- Biologically important areas (BIA) for any threatened or migratory species listed under the EPBC Act, with the exception of the Whale Shark (see below).

Listed threatened and migratory species identified from the EPBC Protected Matters Search Tool within a 20km buffer around the Vesta-1 & 2 wells location (DotEE 2016) are summarised in Table 4.1: .

Table 4.1: State and Commonwealth listed threatened and migratory species

	Status	Type of Presence
	Cwth[1]	
Cetaceans		
Blue Whale *Balaenoptera musculus*	E, M	Species or species habitat likely to occur within area
Sei Whale *Balaenoptera borealis*	V, M	Species or species habitat may occur within area
Fin Whale *Balaenoptera physalus*	V, M	Species or species habitat may occur within area
Humpback Whale *Megaptera novaeangliae*	V, M	Species or species habitat may occur within area
Antarctic Minke Whale *Balaenoptera bonaerensis*	M	Species or species habitat may occur within area
Bryde's Whale *Balaenoptera edeni*	M	Species or species habitat may occur within area
Killer Whale, Orca *Orcinus orca*	M	Species or species habitat may occur within area
Sperm Whale *Physeter macrocephalus*	M	Species or species habitat may occur within area
Spotted Bottlenose Dolphin *Tursiops aduncus*	M	Species or species habitat may occur within area
Marine Reptiles		
Loggerhead Turtle *Caretta caretta*	E, M	Species or species habitat likely to occur within area
Green Turtle *Chelonia mydas*	V, M	Species or species habitat known to occur within area
Leatherback Turtle, Leathery Turtle *Dermochelys coriacea*	E, M	Species or species habitat likely to occur within area
Hawksbill Turtle *Eretmochelys imbricata*	V, M	Species or species habitat likely to occur within area
Olive Ridley Turtle *Lepidochelys olivacea*	E, M	Species or species habitat likely to occur within area
Flatback Turtle *Natator depressus*	V, M	Species or species habitat known to occur within area
Sharks and Rays		
Northern River Shark *Glymphis garricki*	E	Species or species habitat may occur within area
Great White Shark *Carcharodon carcharias*	V, M	Species or species habitat may occur within area
Whale Shark *Rhincodon typus*	V, M	Foraging, feeding or related behaviour known to occur within area
Largetooth Sawfish *Pristis pristis*	V, M	Species or species habitat known to occur within area
Green Sawfish *Pristis zijsron*	V, M	Species or species habitat known to occur within area
Shortfin Mako *Isurus oxyrinchus*	M	Species or species habitat likely to occur within area
Longfin Mako *Isurus paucus*	M	Species or species habitat likely to occur within area
Reef Manta Ray *Manta alfredi*	M	Species or species habitat may occur within area
Giant Manta Ray *Manta birostris*	M	Species or species habitat may occur within area
Avifauna		
Curlew Sandpiper *Calidris ferruginea*	C, M	Species or species habitat may occur within area
Eastern Curlew *Numenius adagascariensis*	C, M	Species or species habitat may occur within area

	Status	Type of Presence
	Cwth[1]	
Australian Lesser Noddy *Anous tenuirostris melanops*	V, M	Species or species habitat may occur within area
Streaked Shearwater *Calonectris leucomelas/ Puffinus leucomelas*	M	Species or species habitat may occur within area
Common Noddy *Anous stolidus*	M	Species or species habitat may occur within area
Lesser Frigatebird *Fregata ariel*	M	Species or species habitat likely to occur within area
Great Frigatebird *Fregata minor*	M	Species or species habitat may occur within area

Source: DotEE (2016)
Note:
[1] Status under the EPBC Act (Cwth): V = Vulnerable; E = Endangered; C = Critically Endangered; M = Migratory.

Some or all of these species may occur on occasion in the EMBA, although the National Conservation Values Atlas (DotEE 2016b) indicates that a BIA for only one of these species (the Whale Shark [*Rhincodon typus*]) overlaps with the area. BIAs are those locations where aggregations of members of a species are known to undertake biologically important behaviours, such as breeding, resting, foraging or migration (DotEE, 2016b). The National Conservation Values Atlas delineates areas of 'aggregation', 'high density foraging' and 'foraging' for the Whale Shark. The Permit Area falls within the 'foraging' BIA which extends northwards (to the 200m isobar) off the West Australian coastline from Ningaloo, but the Permit Area is distant from the areas of important/critical habitat identified in the Whale Shark Recovery Plan (DEH 2005).

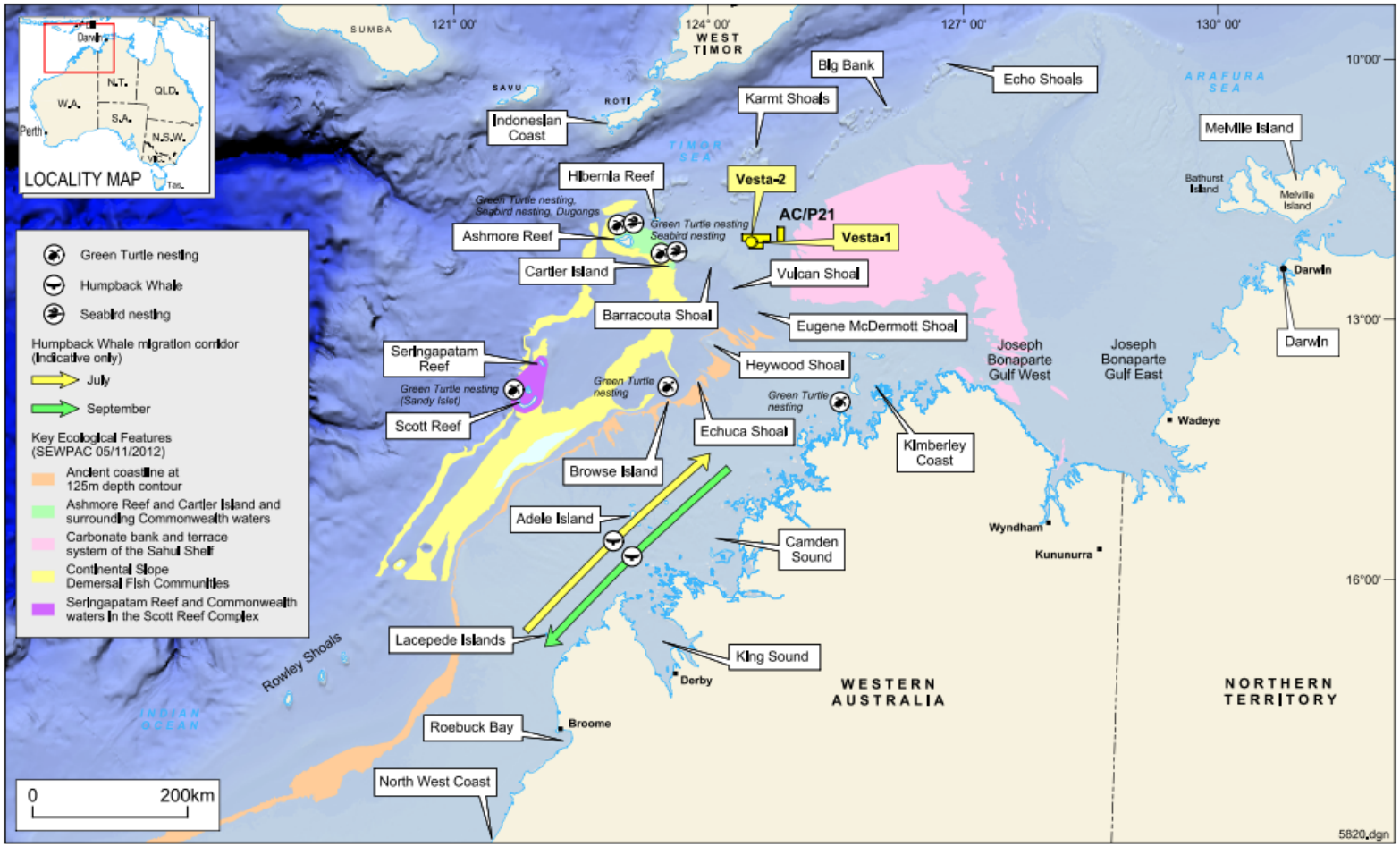

Figure 4.1: KEFs and other environmentally sensitive areas around the Permit Area

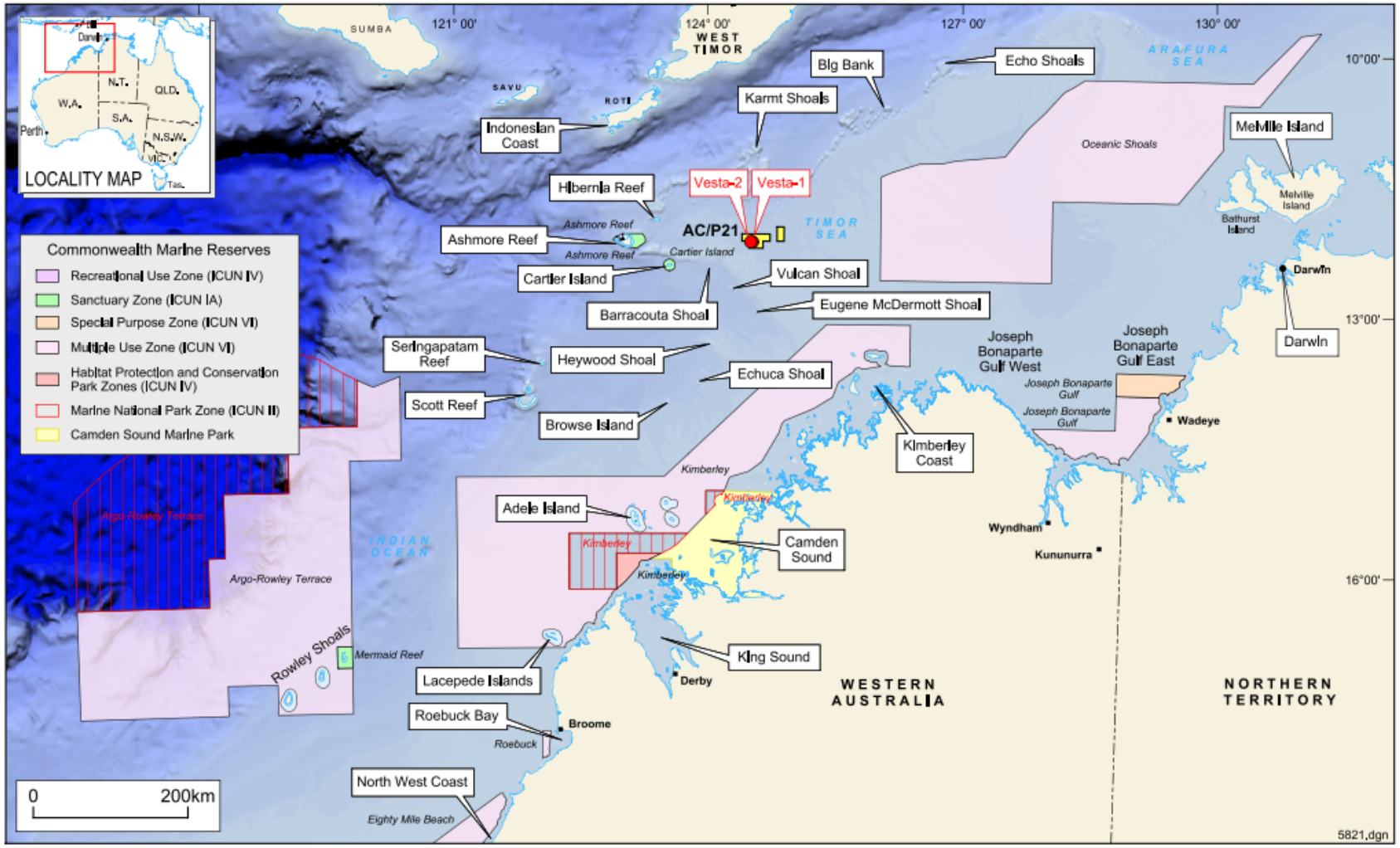

Figure 4.2: Marine protected areas surrounding Permit Area AC/P 21

4.4 Socio-economic environment

The North-west Marine Region and North Marine Region are highly prospective petroleum regions and contain a number of known oil and gas fields. Extensive exploration and development activity has occurred in the Bonaparte Basin. However, there is no production infrastructure in the Permit Area.

There are no major commercial shipping lanes through Permit Area AC/P 21 and consultation with AMSA has confirmed that there is no significant commercial shipping in the vicinity of the well head locations.

The Permit Area is located in offshore waters that are not likely to be accessed for tourism activities (recreational fishing and boating, or charter boat operations) which tend to be focussed around nearshore waters, islands and coastal areas. Apart from the possibility of an occasional passing private motor vessel or yacht, there are no known tourism interests in the area.

Neither of the two Defence training areas in the North Marine Region overlap with the Permit Area. Maritime Border Command (formerly Border Protection Command) patrols the waters for illegal fishing, prohibited imports and exports, quarantine threats and illegal activity in the Marine reserves.

There are no known Indigenous sites of significance or heritage sites, or known historical shipwrecks in the Permit Area and surrounds.

A number of commercial fisheries operate in the Timor Sea and several of these have fishing zones that overlap the Permit Area. Commonwealth and West Australian State Managed Fisheries that overlap the area are summarised below. Due to its remoteness, water depths and lack of seafloor features, the EMBA is likely to have limited prospectivity for commercial fishing. Based on available data and consultation outcomes, no commercial fishing is currently occurring in the Permit Area.

Commonwealth fisheries with zones that overlap the Permit Area include:

- Western Tuna and Billfish Fishery;
- North West Slope Trawl Fishery;
- Southern Bluefin Tuna Fishery;
- Northern Prawn Fishery
- Western Skipjack Fishery.
- State managed fisheries with zones that overlap the Permit Area include:
- Northern Shark Fisheries;
- Northern Demersal Scalefish Managed Fishery:

- Mackerel Managed Fishery;
- Pearl Oyster Managed Fishery;
- Beche-de-mer Fishery.

5. ENVIRONMENTAL IMPACTS AND RISKS

The Eni philosophy to manage environmental risks is to eliminate or mitigate the risk during the planning phase. Managing risks through design is contingent upon identifying, at an early stage in the project, the sources and pathways by which environmental impacts can occur and the sensitivities of the receiving environment in which the project is situated.

For this project, the planning phase included consideration of alternatives to in situ abandonment, notably the option of well head removal. However, the EMBA associated with this option was significantly larger, the environmental disadvantages outweighed the advantages and it was considered not to meet Eni's risk management philosophy or the obligation to reduce risks to ALARP given that:

- Removal would require mobilisation of a marine spread of one or more vessels to transit to/from and work in the Permit Area, introducing inherent environmental impacts and/or risks associated with discharges, emissions, underwater noise and vessel movements (including both marine fuel oil spill risk and fauna collision risk). A marine fuel oil spill from vessel collision has the potential to impact the highly sensitive environmental resources that occur in the region.

- The well heads have remained undisturbed for a significant period of time, are likely to support attached marine growth and/or may be partially buried. Studies of well heads at similar water depths elsewhere on the North West Shelf have indicated a pronounced 'reef effect' with encrusting growth on the structures supporting substantially increased local fish diversity (Pradella et al 2013). Removal would result in loss of this habitat/biodiversity, direct disturbance to the benthos immediately surrounding the well sites, and potential indirect disturbance (eg from noise and turbidity) to surrounding areas and associated biota. The most likely method for removing well heads would involve the use of an abrasive cutter utilising high pressure water and abrasive grit particles.

- Mobilisation and use of vessel(s) and associated equipment for cutting and recovering the well heads at sea from >100m of water would introduce safety risks to personnel onboard the vessel(s). It would involve at-sea recovery/deployment of equipment and higher risk factors, such as the use of high pressures, overhead lifting and grinding/cutting operations. Review of the safety risks identified for similar vessel operations revealed that it introduced over 40 individual safety hazards, of which 12 had medium-high potential consequences.

- Once recovered, the well heads would require disposal. Onshore disposal would require handling to transfer the well heads from vessel to vehicle(s), road transport and further handling at the disposal site, all introducing further environmental and safety risks.

The expected or potential impacts associated with the Activity were assessed using the Eni procedure for Risk Management and Hazard Identification. This procedure is consistent with the Australian Standard for Risk Management: *AS/NZS ISO 31000:2009 Risk management – Principles and guidelines* and provides a systematic process for:

1. Identifying each project activity and its associated environmental aspects.
2. Identifying the environmental values within and adjacent to the area.
3. Defining the potential environmental effects (impacts) of aspects identified in Step 1 above on the values identified in Step 2 above.
4. Identifying the potential environmental consequences and severity of the impact (Table 5.2).
5. Identifying the likelihood of occurrence of the consequence, according to a 6-level scale (Table 5.1).
6. Evaluating overall environmental risk levels using the Eni environmental risk matrix (Table 5.3).
7. Identifying mitigation measures, assigning management actions and further recommended risk reduction measures according to risk levels (Table 5.4) in order to reduce the risk to ALARP.

Table 5.1: Likelihood scale

ID	Likelihood	Description
0	Non-credible	Theoretically possible but not known / reasonably expected to have occurred in the exploration and production industry.
(A)	Rare	Known or reasonably expected to have occurred in the exploration and production industry under similar circumstances.
(B)	Unlikely	Known or reasonably expected to have occurred in the company under similar circumstances.
(C)	Credible	Known or reasonably expected to have occurred in the company more than once under similar circumstances.
(D)	Probable	Known or reasonably expected to have occurred in the company more than once a year under similar circumstances.
(E)	Almost certain / will occur	Known or reasonably expected to have occurred at the considered location, more than once a year under similar circumstances.

Table 5.2: Environmental consequence descriptors

Descriptor	Description
(1) Slight	Slight damage / Impacted area <0.1 square mile (0.26 km²)/ temporary impact on a non-sensitive area / minimum and short term impact in the interested community/no problem with stakeholders.
(2) Minor	Minor damage / Impacted area <1.0 square mile (2.6 km²) / an impact on localized areas/an impact on a reduced number of non–compromised species.
(3) Local	Local damage / Impacted area <10 square mile (26 km²) / an impact on protected natural areas/damage for some species. A potential significant damage to the Company's reputation in the region (local impact) problems with regional stakeholders
(4) Major	Significant damage / Impacted area <100 square mile (260 km²) / an impact on areas interested for science/damage to the biodiversity. A serious and permanent damage to the Subsidiary's capacity to maintain its business position in the area with some wider implications for the subsidiary/problems with national stakeholders.
(5) Extensive	Extensive damage / Impacted area >100 square mile (260 km²) / an impact on special areas of conservation/reduction of biodiversity. Potential loss of future business possibilities in the area/region and/or an enduring significant damage to Eni's image in the international field/ problems with international stakeholders.

Table 5.3: Eni risk matrix

Consequence					Likelihood or Annual Frequency					
Severity	Company Reputation	People (Health & Safety)	Environment	Assets / Project	0 0 - Non credible / Could happen in E&P industry (Freq <10-6 /y)	A A - Rare / Reported for E&P industry (Freq 10-6 to 10-4 /y)	B B - Unlikely / Has occurred at least once in Company (Freq 10-4 to 10-3 /y)	C C - Credible / Has occurred several times in Company (Freq 10-3 to 10-1 /y)	D D - Probable / Happens several times per year in Company (Freq 10-1 to 1 /y)	E E - Frequent / Several times per year at one location (Freq >1 /y)
1	1-Slight impact	1-Slight health effect / injury	1-Slight effect	1-Slight damage	Low	Low	Low	Low	Low	Low
2	2-Minor impact	2-Minor health effect / injury	2-Minor effect	2-Minor damage	Low	Low	Low	Medium	Medium	Medium
3	3-Local impact	3-Major health effect / injury	3-Local effect	3-Local damage	Low	Low	Medium	Medium - High	High	High
4	4-National impact	4-PTD or single fatality	4-Major effect	4-Major damage	Low	Medium	Medium - High	High	High	High
5	5-International impact	5-Multiple fatalities	5-Extensive effect	5-Extensive damage	Medium	Medium - High	High	High	High	High

Table 5.4: Risk management actions

Risk Rating	Management Actions Required
Low (L)	*Continuous improvement:* The level of risk is broadly acceptable and generic control measures are required, aimed at avoiding deterioration. * Non-credible hazards require no further risk assessment.
Medium (M)	The level of risk can be tolerable only once a structured review of the risk-reduction measures has been carried out (where necessary, the relevant guidance from the local authorities should be adopted for application of ALARP).
Medium – High (orange)	
High (H)	*Intolerable risk:* The level of risk is not acceptable and risk control measures are required to lower the risk to another level of significance.

The environmental risk assessment process includes an analysis of inherent and residual risk levels. Inherent risk levels assume limited controls are in place. Residual risk levels are based on the application of further recommended risk reduction measures above and beyond those minimum standards, which drive the risk level down to ALARP.

For risks to be considered to be reduced to ALARP the following criteria apply:

- there are no reasonable practicable alternatives to the activity; or
- the cost (i.e. sacrifice) for implementing further measure is disproportionate to the reduction in risk.

Table 5.5: Eni ALARP Factors

ALARP Factors	Description
Eliminate	*Eliminate the source of the risk.*
Substitute	*Substitute the source of the risk*
Engineering	*Engineer out the risk.*
Isolation	*Isolate people or the environment from the risk.*
Administrative	*Provide procedures or training to people to lower the risk.*

Eni considers a range of factors when evaluating the acceptability of impacts associated with its activities. This evaluation is outlined in Table 5.6.

Table 5.6: Eni acceptability Factors

Demonstration of Acceptability	
Compliance with Legal Requirements/Laws/Standards	Considers the legal aspect, particularly compliance with applicable legislative prescriptions and/or regulations in force which imply specific procedures to be carried out by the Titleholder to control the environmental aspect.
Policy Compliance	The risk or impact must be compliant with the objectives of Eni policies.

Demonstration of Acceptability	
Social Acceptability	Considers the 'social' aspects that can alter stakeholder perception on the Titleholder's commitment regarding the safeguard and protection of the environment and that can cause serious harm to the Titleholder's public image.
Area Sensitivity/Biodiversity	The proposed risk or impact controls, environmental performance outcomes and standards must be consistent with the nature of the receiving environment.
Environmentally Sustainable Development (ESD) Principles	The overall activity is consistent with the APPEA Principles of Conduct.
ALARP	There is a consensus among the risk assessment team that risks or impacts are at ALARP.

Risk identification and assessment for well head abandonment was undertaken and all the credible risks of the proposed Activity were assessed and performance outcomes, control measures and measurement criteria to reduce the risks to ALARP and acceptable levels were developed. A summary of the environmental risks, control measures and risk ranking for the Activity is provided in Table 5.7.

During the review of the risks associated with well head abandonment, the following risks were determined not to be credible following consideration of the characteristics of the EMBA (particularly water depth and remoteness), the scale of the well head structures, previous P&A activity and/or the outcomes of stakeholder consultation:

- Interference with recreational vessels or tourism operations - no known tourism occurs in the area and, being over 100m below the sea surface, the well heads would not affect the movements or activities of occasional passing private motor vessels or yachts. No recreational fishing occurs in the area.

- Interference with commercial shipping - AMSA has advised that the well heads would not pose a risk to shipping due to their low profile relative to prevailing water depths. No major shipping routes coincide with the Permit Area and vessel density in the vicinity is low.

- Disruption to defence training or operational activities - there are no designated training areas that overlap the EMBA and the low profile of the well head structures in the context of overlying water depths at the well locations precludes potential impacts to vessel movements.

- Simultaneous failure of multiple downhole barriers resulting in loss of well integrity (and hydrocarbon release) - Vesta-1 & 2 were plugged and abandoned in accordance with the Eni well abandonment standard, with every zone of potential inflow of hydrocarbons or water isolated by means of a primary and secondary barrier and both wells plugged with over 100m of cement. EOWARs demonstrating that efficient well barriers are in place and that the wells were abandoned in accordance with the WOMPs have been submitted to and accepted by NOPSEMA in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011. With both wells adequately

plugged and abandoned and the well integrity confirmed, there is no further risk of loss of well fluids from either wells.

- Physical impact resulting in loss of well integrity (and hydrocarbon release) - the NOPSEMA accepted EOWARs demonstrate that the well heads are inconsequential to hydrocarbon containment. With both wells plugged with over 100m of cement and well integrity confirmed through the downhole barriers, in the unlikely event of physical damage to well heads, the risk of loss of hydrocarbons was deemed non-credible.

- Impacts on water quality from release of residual treated fluids left in the well heads at the completion of P&A - at the completion of drilling, the wells were plugged and the well heads and upper pipework flooded with seawater/brine treated with biocide and oxygen scavenger. The concentrations of the active constituents of the chemicals in the treated water would have gradually diminished over time, both through performing their function and as a result of natural degradation processes, particularly once the seal in the casing (corrosion) cap had perished and mixing of external seawater and the treated water in the wells could occur. Given the extended period since the treated water was introduced to the wells, combined with the long time that the well heads would have been open to surrounding waters, it was not considered credible that release of treated seawater/brine in the wells as a result of well head corrosion could involve sufficient volumes of active ingredients to adversely impact surrounding water quality/biota.

Table 5.7: Summary of environmental impacts and risks and control measures for Vesta-1 & 2 well head abandonment

Hazard	Potential Impact	Control Measures[1]	Frequency	Severity	Residual Risk
Interaction with other users	The continued physical presence of the well heads on the seabed as a result of insitu abandonment has the potential to interfere with commercial fishing activities in the area. A number of Commonwealth and West Australian State managed fisheries have zones that overlap the Permit Area. If fishing activity occurred at the well sites, there is the possibility that gear, particularly trawl nets, might get snagged or that fishers might lose an area of productive fishing if they avoided the well heads. However, the remoteness and deep waters of the EMBA, combined with the absence of seafloor features, suggest that it is unlikely to represent an important area for fishing now or in the foreseeable future. Fisheries management reports (ABARES 2016, Fletcher and Santoro 2015) indicate the well head locations are outside the areas of usual fishing effort for all of the fisheries that operate in the vicinity of the Permit Area. Consultation has been undertaken with relevant commercial fishing representatives regarding the proposed abandonment and no issues have been raised.	Eni will implement the following controls to reduce the potential impact of interference with other users: • Consultation with key stakeholders including provision of a map and coordinates of the well head locations; • Liaison with the Australian Hydrographic Service to ensure the well head locations are marked on marine charts. These controls were implemented during the development of the EP	A	1	Low
Seabed disturbance	The physical presence of the well heads may locally alter sediment transport patterns, potentially disturbing the seabed (eg scouring or accretion) and associated benthic habitats. The area of impact is expected to be limited to the area immediately surrounding each well head. A number of studies of physical effects on sediment movements associated with anthropogenic structures on the seabed, such as shipwrecks and artificial reefs, indicate impacts to be limited to within 10s of metres of the structure (eg Smiley 2006; Lewis and Pagano 2016). The benthic habitats in the EMBA predominantly comprise sandy sediments with	No practicable control measures were identified[1]. The inherent risk was assessed as low and considered to meet Eni's acceptability and ALARP criteria.	D	1	Low

[1] The option of cutting and recovery of the well heads was considered. However, given the very low environmental impact/risk levels associated with the wellheads remaining on the seafloor, the risk assessment concluded that the overall cost of wellhead removal, including safety risks, environmental impacts/risks and financial costs, was grossly disproportionate to any potential environmental benefit.

	sparse fauna/infauna and are known to be widely represented throughout the Permit Area and across broader areas of the shelf. The water depths (>100m) preclude the presence of photosynthetic benthos and potential effects from shading. Any localised scouring or accretion of sediments could locally alter associated benthic communities, but given the scale of potential impact in the context of the available area of similar habitat, is not expected to result in significant impact to any biotic assemblage. Considering the extended period that the well heads have already been in place, any changes in benthic communities are likely to have already occurred.				
Alteration of marine habitat	The well heads may locally alter marine habitat by providing an area of hard substrate with vertical structural complexity in place of the relatively flat, soft sediments that were present prior to drilling. This effect is likely to have already occurred given the period the well heads have been in place, but in situ abandonment may allow further development and will retain the changes for the life of the structures. The physical presence of anthropogenic structures on the seabed in an area of generally flat, soft sediments is known to provide hard substrate that becomes colonised with fouling organisms and may support increased fish communities (Van der Stap et al 2016). In some circumstances, these areas may in turn also support foraging by marine megafauna (Arnould et al 2015). Each of the well heads was located in an area devoid of vertical structure and comprising soft sediments. If they have not become covered or partially covered by mobile sediments, the well heads are likely to have been colonised by a diverse epibenthic assemblage and may now support a range of fish species. Studies on well heads at similar depths on the North West Shelf after 16 to 22 years on the seabed have found the structures to be heavily encrusted with soft corals, sponges and barnacles and to support diverse fish taxa, ranging from small site-attached species to large pelagics (Pradella et al 2013). The extent of any effects on habitats (and associated communities) is expected to be limited to the immediate vicinity of the well head structures and may ultimately decline as these structures degrade over time. While some positive effects on local biodiversity are likely to have resulted, this effect is expected to be negligible in a regional context given the small scale of the structures. Considering the widespread distribution through the Permit Area and broader region of the soft sediment habitats that have been modified by the presence of the well heads, the change to this habitat type and associated biota is unlikely	No practicable control measures were identified[1]. The inherent risk was assessed as low and considered to meet Eni's acceptability and ALARP criteria.	D	1	Low

	to have a significant impact on regional species composition or ecological function.				
Seabed contamination	The well head structures are predominantly steel and some cement. Over time, corrosion of the structure may contribute to an increase in breakdown products (mostly iron compounds) in the sediments surrounding the well heads. Due to the robustness of the materials involved and the deep water location of the wells, degradation is likely to be a relatively slow process. Iron compounds generally have no to very low toxicity to marine organisms and any build up in the sediments surrounding the well heads through ongoing deposition would be counteracted by gradual dissipation as a result of local sediment movements. The potential for impacts is likely to be limited to the immediate vicinity of each well head and expected to have negligible effect on ecosystem function within the EMBA or broader environment.	No practicable control measures were identified[1]. The inherent risk was assessed as low and considered to meet Eni's acceptability and ALARP criteria.	D	1	Low

6. ONGOING MONITORING OF ENVIRONMENTAL PERFORMANCE

Eni operates under an HSE Integrated Management System (IMS). This system provides a structured framework for applying corporate principles into a regional workable management system. The HSE IMS structure is based on five key elements: policy, planning, implementation and operation, monitoring and review.

Eni's HSE IMS has achieved certification with ISO14001:2004 Environmental Management Systems. This certification provides audited assurance of a best practice environmental management system based on continual improvement.

Specific responsibilities identified with respect to environmental management arrangements (i.e. control implementation) are assigned in the accepted EP's implementation strategy. The implementation strategy in the accepted EP for this Activity notes that all controls have been implemented and that the environmental performance outcomes and standards for the Activity have been met. As there will be no further Activity in relation to Vesta-1 & 2 wells following NOPSEMA acceptance of the EP, no further monitoring, recording, audit, management of non-conformance, or review of environmental performance is required.

7. OIL POLLUTION EMERGENCY PLAN (OPEP)

As the ongoing integrity of the wells has been assured by the previous WOMP activities, no further onsite operations are proposed in relation to the Vesta-1 & 2 wells, including well heads, which will be left undisturbed and abandoned in situ.

The environmental risk assessment for the well head abandonment concluded that there were no credible oil spill risks. Accordingly, no oil pollution emergency response arrangements are required.

8. CONSULTATION

Eni has consulted with relevant stakeholders regarding in situ abandonment of the Vesta-1 & 2 well heads. The consultation comprised written notification, including a map and the geographical coordinates of each of the well heads, and follow up phone calls and/or emails. Stakeholder input was sought prior to the project risk assessment, and the outcomes of the risk assessment, including proposed controls, were also subsequently communicated to stakeholders.

Eni has allowed each relevant person a reasonable period for assessing consultation material provided. No concerns or objections were received from stakeholders in relation to the proposed Activity that have not been addressed (Table 8.1).

Table 8.1: Consultation summary and assessment

Stakeholder	Consultation assessment
Australian Fisheries Management Authority (AFMA)	AFMA has been kept well informed regarding the proposed abandonment of well heads in the Permit Area. AFMA is 'less concerned' about the risk of entanglement by fishing gear of operators in the area because of: - The location of the wells - The fact the wells have been abandoned for ten years without incident. No objection or concern has been raised in relation to the proposal that has not been addressed.
Australian Hydrographic Service (AHS)	AHS has been kept well informed regarding the proposed abandonment of well heads in the Permit Area. The well head positions and dimensions were provided to AHS along with AMSA's request that they be included on maritime charts. No objection or concern has been raised in relation to the proposal that has not been addressed.
Australian Maritime Safety Authority (AMSA)	AMSA has been kept well informed regarding the proposed abandonment of well heads in the Permit Area. AMSA advised the well heads will not pose an issue for a vessel's normal navigation in the area given the depth of the water in relation to the elevation of the well heads. AMSA requested that Eni notify AHS so that the well heads could be properly charted to ensure they wouldn't pose a safety issue for offshore fishing vessels or vessels engaged in military operations. No objection or concern has been raised in relation to the proposal that has not been addressed.
Department of the Environment and Energy (DotEE)	DotEE has been kept well informed regarding the proposed abandonment of well heads in the Permit Area. The DotEE Assessments and Sea Dumping Section has advised that a sea dumping permit is considered necessary. Eni is committed to complying with the requirements of the Sea Dumping Act and is continuing liaison with DotEE during the sea dumping permit application process. No objection or concern has been raised by DotEE in relation to the proposal that has not been addressed.

The following additional stakeholders have been kept well informed regarding Vesta-1 & 2 well head abandonment and have not raised any objection or concern in relation to the Activity: Commonwealth Fisheries Association (CFA), Department of Defence (DoD), Department of Immigration and Border Protection (DIBP), Department of Infrastructure and Regional Development (DIRD), WA Department of Fisheries (DoF), National Offshore Petroleum Titles Administrator (NOPTA), Northern Territory Department of Primary Industry and Resources (NTDPIR) Fisheries, NTDPIR Mines and Energy, Northern Territory Seafood Council (NTSC), Western Australian Fishing Industry Council (WAFIC), Recfishwest.

On assessment of the activity covered under the EP and given that the wells have been in place for over 12 (Vesta-1) and 9 (Vesta-2) years, Eni believes there will be no increased risk or impact to stakeholders as a result of the proposed Activity. All relevant stakeholders have been informed of the well head locations during consultation, and Eni has made arrangements for the well heads to be maintained as a feature on marine charts.

Apart from the liaison with DotEE outlined in Table 8.1, Eni has no plans to consult further with stakeholders regarding the Activity.

9. CONTACT DETAILS

The nominated contact person for this proposal is:

Tom Coolican

Deputy Operations and Production Manager

Eni Australia Ltd

Tel: (08) 9320 2639

Email: tom.coolican@eni.com

10. REFERENCES

[1] ABARES (2016). FISHERY STATUS REPORTS 2016, RESEARCHED BY THE AUSTRALIAN BUREAU OF AGRICULTURAL AND RESOURCE ECONOMICS AND SCIENCES (ABARES), SEPTEMBER 2016. AVAILABLE AT: HTTP://DATA.DAFF.GOV.AU/DATA/WAREHOUSE/9AAM/FSRXXD9ABM_/FSR16D9ABM_20160930/00_FISHSTATUS2016_1.1.0.PDF [ACCESSED 29 NOVEMBER 2016]

[2] ARNOULD JPY, MONK J, IERODIACONOU D, HINDELL MA, SEMMENS J, ET AL (2015). USE OF ANTHROPOGENIC SEA FLOOR STRUCTURES BY AUSTRALIAN FUR SEALS: POTENTIAL POSITIVE ECOLOGICAL IMPACTS OF MARINE INDUSTRIAL DEVELOPMENT? PLOS ONE 10(7).

[3] CEE CONSULTANTS (2001). AUDACIOUS PER MARINE ENVIRONMENTAL RECONNAISSANCE STUDY. UNPUBLISHED REPORT TO OMV AUSTRALIA PTY LTD.

[4] COMMONWEALTH OF AUSTRALIA (2012). MARINE BIOREGIONAL PLAN FOR THE NORTH-WEST MARINE REGION, PREPARED UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999, DEPARTMENT OF SUSTAINABILITY, ENVIRONMENT, WATER, POPULATION AND COMMUNITIES.

[5] DEPARTMENT OF ENVIRONMENT AND HERITAGE (DEH) (2005). WHALE SHARK (RHINCODON TYPUS) RECOVERY PLAN 2005-2010. DEPARTMENT OF ENVIRONMENT AND HERITAGE, AUSTRALIAN GOVERNMENT, CANBERRA.

[6] DEPARTMENT OF THE ENVIRONMENT AND ENERGY (DOTEE) (2016). EPBC ACT PROTECTED MATTERS REPORT. AUSTRALIAN GOVERNMENT. REPORT CREATED 22/12/16 16:21:41, COMMONWEALTH OF AUSTRALIA.

[7] DEPARTMENT OF THE ENVIRONMENT AND ENERGY (DOTEE) (2016B). BIOLOGICALLY IMPORTANT AREAS OF REGIONALLY SIGNIFICANT MARINE SPECIES. <HTTPS://WWW.ENVIRONMENT.GOV.AU/MARINE/MARINE-SPECIES/BIAS> VIEWED ONLINE: 18 DECEMBER 2016.

[8] DEPARTMENT OF THE ENVIRONMENT, WATER, HERITAGE AND THE ARTS (DEWHA) (2008). THE NORTH-WEST MARINE BIOREGIONAL PLAN. BIOREGIONAL PROFILE. A DESCRIPTION OF THE ECOSYSTEMS, CONSERVATION VALUES AND USES OF THE NORTH MARINE REGION. AUSTRALIAN GOVERNMENT, CANBERRA

[9] DEPARTMENT OF RESOURCES, ENERGY AND TOURISM (RET) (2010). REGIONAL GEOLOGY OF THE BONAPARTE BASIN. GEOSCIENCE AUSTRALIA. AUSTRALIAN GOVERNMENT, CANBERRA.

[10] FLETCHER, W.J. AND SANTORO, K. (EDS). (2015). STATUS REPORTS OF THE FISHERIES AND AQUATIC RESOURCES OF WESTERN AUSTRALIA 2014/15: THE STATE OF THE FISHERIES. DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA.

[11] HEYWARD, A. J. AND SMITH, L. D. (1996). ANALYSIS OF TIMOR SEA MACROBENTHOS FROM ROV VIDEO –BAYU-UNDAN. PRODUCED AT THE REQUEST OF BHP PETROLEUM PTY. LTD. BY THE AUSTRALIAN INSTITUTE OF MARINE SCIENCE, DAMPIER, WESTERN AUSTRALIA: IN LEPROVOST DAMES AND MOORE (1997).

[12] HEYWARD, A., PINCERATTO, E. AND SMITH L (1997). BIG BANK SHOALS OF THE TIMOR SEA: AN ENVIRONMENTAL RESOURCE ATLAS. BRISBANE.

[13] LEWIS, P AND M. PAGANO (2015). MONITORING OF THE SOUTHWEST ARTIFICIAL REEF TRIAL IN 2013 AND 2014. IN: STATUS REPORTS OF THE FISHERIES AND AQUATIC RESOURCES OF WESTERN AUSTRALIA 2014/15: THE STATE OF THE FISHERIES. REPORT PREPARED BY FLETCHER, WJ AND SANTORO, K (EDS) FOR THE DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA.

[14] PRADELLA, N, FOWLER, A.M, BOOTH, D.J, AND P.I. MACREADIE (2013). FISH ASSEMBLAGES WITH OIL INDUSTRY STRUCTURES ON THE CONTINENTAL SHELF OF NORTH-WESTERN AUSTRALIA. J. FISH BIOL. 2013.

[15] SMILEY, B.D (2006). THE INTENTIONAL SCUTTLING OF SURPLUS AND DERELICT VESSELS: SOME EFFECTS ON MARINE BIOTA AND THEIR HABITATS IN BRITISH

COLUMBIA WATERS, 2002. CANADIAN SCIENCE ADVISORY SECRETARIAT RESEARCH DOCUMENT 2006/059.

[16] VAN DER STAP T, COOLEN JWP, LINDEBOOM HJ (2016). MARINE FOULING ASSEMBLAGES ON OFFSHORE GAS PLATFORMS IN THE SOUTHERN NORTH SEA: EFFECTS OF DEPTH AND DISTANCE FROM SHORE ON BIODIVERSITY. PLOS ONE 11(1).