Form 59

Rule 29.02(1)

Affidavit

Federal Court of Australia No. 647 of 2023

District Registry: Victoria

Division: General

RAELENE COOPER

Applicant

NATIONAL OFFSHORE PETROLEUM SAFETY AND ENVIRONMENTAL MANAGEMENT AUTHORITY and others

Respondents

This document is in a form that may be uploaded to the online file.

Affidavit of:	**Jessica Louise Border**
Address:	Level 2, 37 St Georges Terrace, Perth WA 6000
Occupation:	Solicitor
Date:	13 September 2023

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Witness Deponent

Filed on behalf of Raelene Cooper, Applicant

Prepared by Jessica Border

Law firm Environmental Defenders Office

Tel +61 8 6118 7919 Fax

Email jessica.border@edo.org.au Ref

Address for Service **Environmental Defenders Office**, Suite 8.02 Level 8/6 O'Connell St, Sydney NSW 2000

I, Jessica Louise Border of Level 2, 37 St Georges Terrace in the State of Western Australia, Solicitor, affirm:

1. I am a Solicitor at the Environmental Defenders Office (**EDO**). I have worked as a lawyer for the EDO since 6 December 2022. Under the supervision of Clare Lakewood, Special Counsel, Safe Climate (Gas), EDO, the EDO acts for the Applicant (Ms Raelene Cooper) in this proceeding, and for Ms Cooper and Ms Josie Alec in respect of their dealings with Woodside Energy Group (**Woodside Energy**).

2. This is the third affidavit I have deposed in this proceeding.

3. The contents of this affidavit are true and correct to the best of my knowledge or belief. Where information is not within my direct knowledge, I have stated the source of that information.

Drilling activities for the Scarborough project

4. I have read the Affidavit of [redacted] affirmed on 10 September 2023 ([redacted] **Affidavit**) and provided to the parties and the Court in these proceedings.

5. The purpose of this affidavit is to respond to the following matters contained in the [redacted] Affidavit:

   (a) at [63], Mr [redacted] deposes to the fact that the timeframe for drilling to commence depends on regulatory approval of the Scarborough Drilling and Completions Environment Plan (**Drilling EP**);

   (b) at [64], Mr [redacted] deposes that it is 'hoped' that NOPSEMA will accept the Drilling EP in the 'coming weeks or months'; and,

   (c) at [73], Mr [redacted] deposes to his belief that 'the data obtained before drilling would better inform the location for a potential ninth well in the Phase 1 drilling campaign'.

6. On 12 September 2023, I reviewed the website of NOPSEMA pertaining to the Scarborough Drilling and Completions (accessible at <https://info.nopsema.gov.au/environment_plans/565/show_public>) (**NOPSEMA Website – Scarborough Drilling page**).

7. Published on the NOPSEMA Website – Scarborough Drilling page is a copy of a document titled the Drilling EP dated November 2021.

8. On 12 September 2023 I downloaded the Drilling EP from the NOPSEMA Website – Scarborough Drilling page.

Attached marked **JLB-3.1** is a true copy of and extract of pages 1 – 52 of the Drilling EP downloaded from the NOPSEMA Website – Scarborough Drilling page on 12 September 2023.

9. I understand from my review of the Drilling EP that:

(a) the activities defined in the Drilling EP are a part of the Scarborough Offshore Project Proposal (**Scarborough OPP**) accepted by NOPSEMA on 30 March 2020; (**JLB-3.1, p 16**);

(b) the activities under the Drilling EP will be undertaken in Petroleum title WA-61-L (**JLB-3.1, p 16**) which forms part of the area in which the activities under the Seismic Survey EP will occur (Affidavit of Jessica Louise Border affirmed 17 August 2023, JLB-1.2, p 26);

(c) the Scarborough OPP contemplated the drilling of 7 Phase 1 Development wells; (**JLB-3.1, p 35**);

(d) the Drilling EP contemplates 'drilling and production of eight to ten production wells' (**JLB-3.1, p 16**); and

(e) it is now proposed that 8 development wells be drilled as part of Phase 1, with potential for two additional contingent wells. This is within the scope of the total well count assessed by the OPP (30 wells) however is slightly more than the original estimate for the first drilling phase provided in Table 4-8 of the description of Drilling Activities. (**JLB-3.1, p 35**).

10. I conducted an electronic search within the Drilling EP for the terms 'Save Our Songlines' and 'Cooper'. Those searches returned no relevant results.

11. I am:

(a) informed by Ms Cooper and believe; and

(b) aware from my involvement as Ms Cooper's solicitor in relation to matters involving the Scarborough Project,

that Ms Cooper has not been consulted and wishes to be consulted in relation to the Drilling EP (and other Environment Plans relevant to the Scarborough Project that are not the subject of these proceedings).

Affirmed by the deponent Jessica Louise Border
at Perth
on 13 September 2023
Before me:

.....
Signature of deponent

.....
Signature of witness

Name of witness: Timothy Paul Lucas Drok

A legal practitioner who has held a practice certificate for at least 2 years and who holds a current practice certificate

Schedule

Federal Court of Australia — No.

District Registry: Victoria

Division: General

Respondents

Second Respondent: **WOODSIDE ENERGY SCARBOROUGH PTY LTD**
ACN 650 177 227

Third Respondent: **WOODSIDE ENERGY (AUSTRALIA) PTY LTD**
ACN 006 923 879

Annexure

Federal Court of Australia No. 647 of 2023

District Registry: Victoria

Division: General

RAELENE COOPER

Applicant

NATIONAL OFFSHORE PETROLEUM SAFETY AND ENVIRONMENTAL MANAGEMENT AUTHORITY and others

Respondents

This is the annexure marked **JLB-3.1** produced and shown to Jessica Louise Border at the time of affirming her affidavit on 13 September 2023.

Timothy Paul Lucas Drok

A legal practitioner who has held a practice certificate for at least 2 years and who holds a current practice certificate

Scarborough Drilling and Completions Environment Plan

November 2021

Revision 0

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1. INTRODUCTION

1.1 Overview

The Scarborough gas resource, located in Commonwealth waters approximately 375 km west-northwest of the Burrup Peninsula, forms part of the Greater Scarborough gas fields, comprising the Scarborough, North Scarborough, Thebe and Jupiter gas fields (**Figure 3-1**). Woodside Energy Scarborough Pty Ltd (Woodside), as Titleholder under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (referred to as the Environment Regulations), proposes to undertake the following petroleum activities within Permit Area WA-61-L:

- drilling and development of eight to ten production wells
- Inspection, Monitoring, Maintenance and Repair (IMMR) activities for installed infrastructure.

These activities will hereafter be referred to as the Petroleum Activities Program and form the scope of this Environment Plan (EP).

This EP has been prepared by Woodside as part of the requirements under the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

The Petroleum Activities Program as defined in this EP is a part of the Scarborough Offshore Project Proposal (OPP) accepted by NOPSEMA on 30th March 2020.

1.2 Defining the Petroleum Activity

The Petroleum Activities Program to be undertaken within Permit Area WA-61-L comprises petroleum activities, drilling and completions, as defined in Regulation 4 of the Environment Regulations.

1.3 Purpose of the Environment Plan

In accordance with the objectives of the Environment Regulations, the purpose of this EP is to demonstrate that:

- the potential environmental impacts and risks (planned (routine and non-routine) and unplanned) that may result from the Petroleum Activities Program are identified;
- appropriate management controls are implemented to reduce impacts and risks to a level that is ‘as low as reasonably practicable’ (ALARP) and acceptable; and
- the Petroleum Activities Program is performed in a manner consistent with the principles of ecologically sustainable development (as defined in Section 3A of the *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) (EPBC Act)).

This EP describes the process and resulting outputs of the risk assessment, whereby impacts and risks are managed accordingly.

The EP defines activity-specific Environmental Performance Outcomes (EPOs), environmental performance standards (EPSs) and measurement criteria (MCs). These form the basis for monitoring, auditing and management of the Petroleum Activities Program to be undertaken by Woodside and its contractors. The implementation strategy (derived from the decision support framework tools) specified within this EP provides Woodside and NOPSEMA with the required level of assurance that impacts, and risks associated with the activity are reduced to ALARP and are acceptable.

1.4 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3**. The spatial boundary of the Petroleum Activities Program has been described and assessed using two 'areas', the Operational Area and the Permit Area. The combination of the Operational Area and Permit Area defines the spatial boundary of the Petroleum Activities Program, as described, risk-assessed and managed by this EP.

This EP addresses potential environmental impacts from planned activities within the Operational Area and any potential unplanned events that originate from the activity within the Operational Area.

Transit to and from the Operational Area by MODU, installation vessels and support vessels as well as port activities associated with these vessels, are not within the scope of this EP. Vessels supporting the petroleum activities operating outside the Operational Area (e.g. transiting to and from port) are subject to all applicable maritime regulations and other requirements and are not managed by this EP.

1.5 Environment Plan Summary

An EP summary will be prepared based on the material provided in this EP, addressing the items listed in **Table 1-1** as required by Regulation 11(4).

Table 1-1: EP Summary

EP Summary material requirement	Relevant section of EP containing EP Summary material
The location of the activity	**Section 3.4**
A description of the receiving environment	**Section 4**
A description of the activity	**Section 3**
Details of the environmental impacts and risks	**Section 6**
The control measures for the activity	**Section 6.3**
The arrangements for ongoing monitoring of the titleholder's environmental performance	**Section 6**
Response arrangements in the oil pollution emergency plan	**Section 7.9**
Consultation already undertaken and plans for ongoing consultation	**Section 5**
Details of the titleholders nominated liaison person for the activity	**Section 1.8**

1.6 Structure of the Environment Plan

This EP has been structured to reflect the process and requirements of the Environment Regulations as outlined in **Table 1-2**.

Table 1-2: EP process phases, applicable regulations and relevant section of EP

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
Regulation 10A(a): *Is appropriate for the nature and scale of the activity*	Regulation 13: *Environmental assessment* Regulation 14: *Implementation strategy for the environment plan* Regulation 16: *Other information in the environment plan*	The principle of 'nature and scale' is applicable throughout the EP.	**Section 2** **Section 3** **Section 4** **Section 54.9** **Section 6** **Section 7**
Regulation 10A(b): *Demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable* Regulation 10A(c): *Demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	Regulation 13(1)–13(7): *13(1) Description of the activity* *13(2)(3) Description of the environment* *13(4) Requirements* *13(5)(6) Evaluation of environmental impacts and risks* *13(7) Environmental Performance Outcomes and standards* *Regulation 16(a) to 16(c):* *A statement of the titleholder's corporate environmental policy* *A report on all consultations between the titleholder and any relevant person*	Set the context (activity and existing environment). Define 'acceptable' (the requirements, the corporate policy, relevant persons). Detail the impacts and risks. Evaluate the nature and scale. Detail the control measures – ALARP and acceptable.	**Section 1** **Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
Regulation 10A(d): *Provides for appropriate Environmental Performance Outcomes, environmental performance standards and measurement criteria*	Regulation 13(7): *Environmental Performance Outcomes and standards*	Environmental Performance Outcomes (EPO). Environmental performance standards (EPS). Measurement criteria (MC).	**Section 6**
Regulation 10A(e): *Includes an appropriate implementation strategy and monitoring, recording and reporting arrangements*	Regulation 14: *Implementation strategy for the environment plan*	Implementation strategy, including: • Environmental Management System (EMS) • Performance monitoring • Oil Pollution Emergency Plan (OPEP – per **Table 7-4**) and scientific monitoring • Ongoing consultation	**Section 7** **Appendix D**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
Regulation 10A(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 (EPBC Act)*	Regulation 13(1)–13(3): *13(1) Description of the activity* *13(2) Description of the environment* *13(3) Without limiting [Regulation 13(2)(b)], relevant values and sensitivities may include any of the following:* *(a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act;* *(b) the national heritage values of a National Heritage place within the meaning of that Act;* *(c) the ecological character of a declared Ramsar wetland within the meaning of that Act;* *(d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act;* *(e) the presence of a listed migratory species within the meaning of that Act;* *(f) any values and sensitivities that exist in, or in relation to, part or all of:* *(i) a Commonwealth marine area within the meaning of that Act; or* *(ii) Commonwealth land within the meaning of that Act.*	No activity, or part of the activity, undertaken in any part of a declared World Heritage property.	**Section 3** **Section 4** **Section 6**
Regulation 10A(g): *(i) the titleholder has carried out the consultations required by Division 2.2A* *(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate*	Regulation 11A: *Consultation with relevant authorities, persons and organisations, etc.* *Regulation 16(b):* *A report on all consultations between the titleholder and any relevant person*	Consultation undertaken in the preparation of this EP.	**Section 5**
Regulation 10A(h): *Complies with the Act and the regulations*	Regulation 13(4)a: *Describe the requirements, including legislative requirements, that apply to activity and are relevant to the environmental management of the activity* *Regulation 15:* *Details of the Titleholder and liaison person* *Regulation 16(a):* *A statement of the titleholder's corporate environmental policy* *Regulation 16(c):* *Details of all reportable incidents in relation to the proposed activity*	All contents of the EP must comply with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and the Environment Regulations	**Section 1.6** **Section 1.7** **Section 1.8** **Section 6.7**

1.7 Description of the Titleholder

Woodside is Operator of the various joint ventures relating to the Scarborough Project, which comprises the Scarborough, North Scarborough, Thebe and Jupiter fields. The joint ventures comprise both Woodside and BHP Petroleum (Australia) Pty Ltd.

Woodside is the largest Australian natural gas producer. The company operates Australia's biggest resource development, the North West Shelf Project (NWS Project) in Western Australia.

The Woodside-operated producing LNG assets in the north-west of Australia are among the world's best facilities. The NWS Project has been operating for 35 years delivering one-third of Australia's oil and gas production from one of the world's largest LNG facilities. Pluto LNG also forms part of Woodside's outstanding base business, and since commissioning in 2012, has delivered over 500 LNG cargoes.

Woodside recognises that strong environmental performance is essential to success and continued growth. Woodside has an established methodology to identify impacts and risks and assess potential consequences of activities. Strong partnerships, sound research and transparency are the key elements of Woodside's approach to the environment.

1.8 Details of Titleholder, Liaison Person and Public Affairs Contact

In accordance with Regulation 15 of the Environment Regulations, details of the titleholders, liaison person and arrangements for the notification of changes are described below.

1.8.1 Titleholders

Woodside Energy Scarborough Pty Ltd:
11 Mount Street, Perth, Western Australia
Telephone: 08 9348 4000
Fax Number: 08 9214 2777
ABN: 650 177 227

1.8.2 Nominated Liaison Person

Ryan Felton
Senior Corporate Affairs Advisor
11 Mount Street, Perth, Western Australia
Phone: 08 9348 4000
Fax Number: 08 9214 2777
feedback@woodside.com.au

1.8.3 Arrangements for Notifying of Change

Should the titleholder, titleholder's nominated liaison person or the contact details for either change, then NOPSEMA is to be notified of the change in writing within two weeks or as soon as practicable.

1.9 Woodside Management System

The Woodside Management System (WMS) provides a structured framework of documentation to set common expectations governing how all employees and contractors at Woodside will work. Many of the standards presented in **Section 6** are drawn from the WMS documentation, which comprises of four elements: Compass and Policies, Expectations, Processes and Procedures, and Guidelines, outlined below (and illustrated in **Figure 1-1**):

- **Compass and Policies:** Set the enterprise-wide direction for Woodside by governing our behaviours, actions and business decisions and ensuring we meet our legal and other external obligations.

- **Expectations:** Set essential activities or deliverables required to achieve the objectives of the Key Business Activities and provide the basis for development of processes and procedures.
- **Processes and Procedures:** Processes identify the set of interrelated or interacting activities which transforms inputs into outputs, to systematically achieve a purpose or specific objective. Procedures specify what steps, by whom and when are required to carry out an activity or a process.
- **Guidelines:** Provide recommended practice and advice on how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide advice on: how activities or tasks may be performed; information that may be taken into consideration; or, how to use tools and systems.

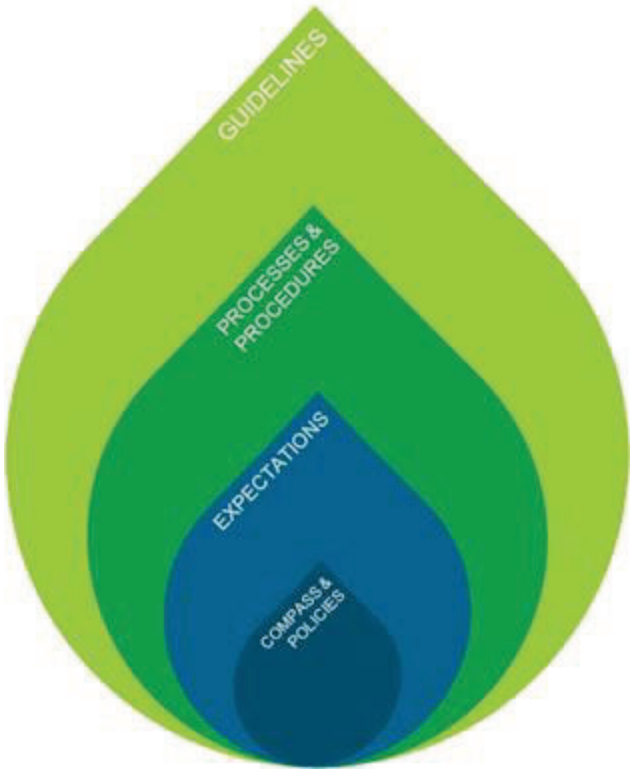

Figure 1-1: The four major elements of the WMS framework

The WMS is organised within a business process hierarchy based upon key business activities to ensure the system remains independent of organisation structure, is globally applicable and scalable wherever required. These business activities are grouped into management, support and value stream activities as shown in **Figure 1-2**. The value stream activities capture, generate and deliver value−through the exploration and production (E and P) lifecycle. The management activities influence all areas of the business, while support activities may influence one or more value stream activities.

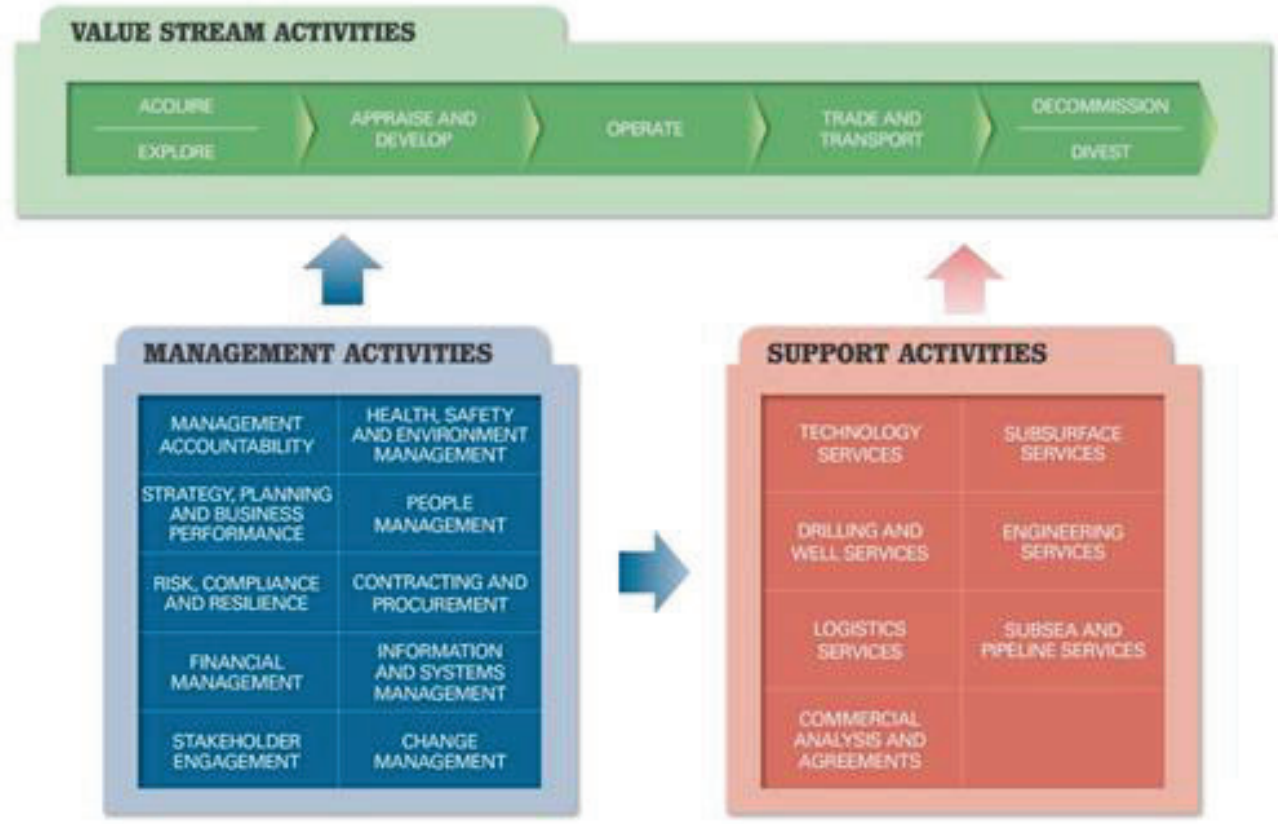

Figure 1-2: The WMS business process hierarchy

1.9.1 Health, Safety, Environment and Quality Policy

In accordance with Regulation 16(a) of the Environment Regulations, Woodside's Corporate Health Safety, Environment and Quality Policy is provided in **Appendix A** of this EP.

1.10 Description of Relevant Requirements

In accordance with Regulation 13(4) of the Environment Regulations, a description of requirements, including legislative requirements, that apply to the activity and relevant to the management of risks and impacts of the Petroleum Activities Program are detailed in **Appendix B.**

1.10.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) provides the regulatory framework for all offshore petroleum exploration and production and greenhouse gas activities in Commonwealth waters (the ocean area beyond three nautical miles to the outer extent of the Australian Exclusive Economic Zone at 200 nautical miles).

The Act manages all offshore petroleum activities, including decommissioning, under Section 572 and 270. While there are no immediate plans for decommissioning (the scope of this EP is for drilling production wells for future operations) all equipment being installed above the mudline has been designed to allow removal. Subsection 572(2) provides that while structures, equipment and other property remain in the title area, they must be maintained in good condition and repair. Inspection, maintenance and repair of the infrastructure installed for future production, under this Environment Plan, will be managed as described in **Section 3.9**.

The regulatory framework establishes the National Offshore Petroleum Safety and Environment Management Authority as the regulator. Under the OPGGS Act, the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* 2009 (the Environment Regulations), apply to

petroleum activities in Commonwealth waters and are administered by NOPSEMA. The objective of the Environment Regulations is to ensure petroleum activities are:

- consistent with the principles of ecologically sustainable development (as set out in the EPBC Act)
- by which the environmental impacts and risks of the activity will be reduced to ALARP
- by which the environmental impacts and risks of the activity will be of an acceptable level.

1.10.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

One of the objectives of the EPBC Act is to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined under Part 3 of the Act as "Matters of National Environmental Significance" (MNES). The EPBC Act sets a regime which aims to ensure actions taken on (or impacting upon) Commonwealth land or waters are consistent with the principles of ecological sustainable development. When a person proposes to take an action that they believe may need approval under the EPBC Act, they must refer the proposal to the Commonwealth Minister for Environment.

In relation to offshore petroleum activities in Commonwealth waters, in accordance with the "Streamlining Offshore Petroleum Approvals Program" (the Program), requirements under the EPBC Act are now administered by NOPSEMA, commencing February 2014. The Program requires any offshore petroleum activities, authorised by the OPGGS Act to be conducted in accordance with an accepted EP. The definition of 'environment' in the Program covers all matters protected under Part 3 of the EPBC Act.

1.10.2.1 Offshore Project Proposal

Woodside submitted the Scarborough OPP to NOPSEMA for assessment in February 2019 and received approval in March 2020. In accordance with Regulation 31 of the Environment Regulations, references to the Scarborough OPP have been made throughout this EP. The approved OPP is available on the NOPSEMA website: Scarborough Offshore Project Proposal » NOPSEMA.

The Scarborough OPP sets environmental performance outcomes (EPOs) for the project and this Petroleum Activity Program, where relevant. EPOs set the level of performance to be achieved, to ensure that environmental impacts and risks will be of an acceptable level and the project is consistent with the principles of ecologically sustainable development.

1.10.2.2 Recovery Plans and Threat Abatement Plans

Under s139(1)(b) of the EPBC Act, the Environment Minister must not act inconsistently with a recovery plan for a listed threatened species or ecological community or a threat abatement plan for a species or community protected under the Act. Similarly, under s268 of the EPBC Act:

"A Commonwealth agency must not take any action that contravenes a recovery plan or a threat abatement plan."

In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA via the commitments included in the Program. Commitments relating to listed threatened species and ecological communities under the Act are included in the Program Report (Commonwealth of Australia, 2014).

1.10.2.3 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs), formally known as Commonwealth Marine Reserves, are recognised for conserving marine habitats and the species that live and rely on these habitats. The Director of Marine Parks (DNP) is responsible for managing AMP's (supported by Parks Australia), and is required to publish management plans for them. Other parts of the Australian

Government must not perform functions or exercise powers in relation to these parks that are inconsistent with management plans (s.362 of the EPBC Act). Relevant AMPs are identified in **Section 4.8** and described in **Appendix I.** The North-west Marine Parks Network Management Plan (DNP, 2018a) describe the requirements for managing the marine parks that are relevant to this EP.

Specific zones within the AMPs have been allocated conservation objectives as stated below (International Union for Conservation of Nature (IUCN) Protected Area Category) based on the Australian IUCN reserve management principles outlined in Schedule 8 of the EPBC Regulations 2000:

- Special Purpose Zone (IUCN category VI)—managed to allow specific activities though special purpose management arrangements while conserving ecosystems, habitats and native species. The zone allows or prohibits specific activities.
- Sanctuary Zone (IUCN category Ia)—managed to conserve ecosystems, habitats and native species in as natural and undisturbed a state as possible. The zone allows only authorized scientific research and monitoring.
- National Park Zone (IUCN category II)—managed to protect and conserve ecosystems, habitats and native species in as natural a state as possible. The zone only allows nonextractive activities unless authorised for research and monitoring.
- Recreational Use Zone (IUCN category IV)—managed to allow recreational use, while conserving ecosystems, habitats and native species in as natural a state as possible. The zone allows for recreational fishing, but not commercial fishing.
- Habitat Protection Zone (IUCN category IV)—managed to allow activities that do not harm or cause destruction to seafloor habitats, while conserving ecosystems, habitats and native species in as natural a state as possible.
- Multiple Use Zone (IUCN category VI)—managed to allow ecologically sustainable use while conserving ecosystems, habitats and native species. The zone allows for a range of sustainable uses, including commercial fishing and mining where they are consistent with park values.

2. ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process Woodside follows to prepare the EP once an activity has been defined as a petroleum activity. The process (**Section 2.2**) describes the environmental risk assessment methodology that is used to identify, analyse and evaluate risks to meet ALARP and acceptability requirements and to develop EPOs and EPSs. This section also describes Woodside's risk management methodologies applicable to implementation strategies applied during the activity.

Regulation 13(5) of the Environment Regulations requires the detailing of environmental impacts and risks, and evaluation appropriate to the nature and scale of each impact and risk associated with the Petroleum Activities Program. The objective of the risk assessment process, described in this section, is to identify risks and associated impacts of an activity, so that they can be assessed, and appropriate control measures applied to eliminate, control or mitigate the impact/risk to ALARP and determine if the impact or risk level is acceptable.

Environmental impacts and risks assessed include those directly and indirectly associated with the Petroleum Activities Program and includes potential emergency and accidental events.

Planned activities (routine and non-routine) have the potential for inherent environmental impacts. An environmental risk is an unplanned event with the potential for impact (termed risk 'consequence').

Herein, the potential result of planned activities are termed 'impacts', where-as 'risks' are associated with unplanned events with the potential for impact (should the risk be realised); with such potential impacts termed 'consequence'.

2.2 Environmental Risk Management Methodology

An assessment of the impacts and risks associated with the Petroleum Activities Program has been undertaken in accordance with Woodside's Environment Impact Assessment Guideline and Risk Management Procedure. This guideline and procedure set out the broad principles and high-level steps for assessing environmental impacts across the lifecycle of Woodside's activities and managing these during project execution.

The key steps of the Woodside impact and risk management process are comprised of the:

- environmental impact and risk assessment
- communication and consultation that informs the assessment and ongoing environmental performance of the activity
- steps required during implementation of the activity including to monitor, review and report.

2.2.1 Establish the Context

Context is established by considering the proposed activities associated with a Petroleum Activities Program, and the environment in which the activities are planned to take place.

Describing the activity involves the evaluation of whether the activity meets the definition of a "petroleum activity" as defined in the Environment Regulations. The activity is then described in relation to the location, what is to be undertaken and how - this allows for the identification of environmental **aspects** for each activity.

2.2.2 Review of the Significance/Sensitivity of Receptors and Levels of Protection

Sensitivity of receptors relevant to the Scarborough Project, and this Petroleum Activities Program, was determined during development of the Scarborough OPP. As set out within the OPP, the

sensitivity of all project receptors, was determined to be either low, medium or high based on qualitative expert judgement.

During development of this EP, OPP receptor sensitivity determinations were reviewed in the context of any changing legislation or changed knowledge regarding the sensitivity of each receptor. No relevant factors that would change receptor sensitivity (from that determined in the OPP) were identified. Receptor sensitivity determinations from the OPP are used in the risk impact assessment summaries for each environmental risk assessment (refer to **Section 6**).

2.2.3 Environmental Legislation and Other Requirements

In preparing this EP, Woodside has ensured the proposed controls and impact and risk levels are consistent with national and international standards, law and policies (including applicable plans for management and conservation advices, and significant impact guidelines for MNES).

This has included developing the project in accordance with all applicable legislation as identified in **Section 1.10**, and ensuring the requirements of the species recovery plans and conservation advices have been considered to identify any requirements that may be applicable to the risk assessment.

2.2.4 Impact and Risk Identification

Terminology used for this impact and risk assessment has been taken from the impact and risk management process, which is aligned with ISO 13001:2018 and the requirements of Part 2 (regulations 6 to 25A) of the OPPGS Regulations.

Impacts and risks of the Scarborough Project were identified in the scoping phase of the Scarborough Project (and presented within the OPP). During this phase, the relationships between the environmental aspects identified for the proposed activities and the associated potential impacts and risks for each receptor are established. This EP considers relevant impacts and risks associated with the Scarborough Project's Drilling and Completions Campaign.

Using the OPP as a guide, all impacts and risks associated with the Petroleum Activities Program for this EP were identified during the EP scoping phase by undertaking an Environmental Risk and Impact Identification (ENVID) workshop. Impacts, risks and potential consequences were identified based on planned and potential interaction with the activity (based on the description in **Section 3**), the existing environment (**Section 4**) and the outcomes of Woodside's stakeholder engagement process (**Section 5**). The ENVID workshop was undertaken by a multidisciplinary team comprising personnel with sufficient breadth of knowledge, training and experience to reasonably assure that the hazards that may arise in connection with the Petroleum Activity Program in this EP were identified.

Impacts and risks were identified during the ENVID for both planned (routine and non-routine) activities and unplanned (accidents/incidents/emergency conditions) events. During this process, risks identified as not applicable (not credible) were removed from the assessment.

2.3 Impact and Risk Analysis and Evaluation

After identifying impacts and risks, analysis and evaluation is undertaken to determine the extent of the impacts and risks, whether they are acceptable or not, and to identify any impact and risk treatment (or controls) to be implemented.

Impact and risk evaluation are undertaken by assessing the magnitude (i.e. no lasting effect, slight, minor, moderate, major or catastrophic) of the credible environmental impacts from each aspect based on extent, duration, frequency and scale, and then either:

- assigning an impact significance level to each credible environmental impact based on the receptor sensitivity and the magnitude of the impact, OR

- assigning an environmental risk level to each environmental risk based on the receptor sensitivity, magnitude of the consequence, and the likelihood of occurrence.

2.3.1 Impact Evaluation

Impact assessment determines the impact significance of the potential impacts, based on the magnitude and the receptor sensitivity (**Figure 2-1**).

	Receptor Sensitivity		
Magnitude	Low	Medium	High
Catastrophic	B	A	A
Major	C	B	A
Moderate	D	C	B
Minor	E	D	C
Slight	F	E	D
No lasting effect	F	F	E

Significance Level
Catastrophic (A)
Major (B)
Moderate (C)
Minor (D)
Slight (E)
Negligible (F)

Figure 2-1: Impact significance level

2.3.2 Risk Evaluation

In support of ongoing risk management (a key component of Woodside's Process Safety Management Framework – refer to Implementation Strategy (**Section 7**)), Woodside uses the concept of 'current risk' and applies a current risk rating to indicate the current or 'live' level of risk, considering the controls that are currently in place and regularly effective. Current risk rating is effective in articulating potential divergence from baseline risk, such as if certain controls fail or could potentially be compromised. Current risk ratings aid in the communication and visibility of the risk events, and ensures risk is continually managed to ALARP by identifying risk reduction measures and assessing acceptability.

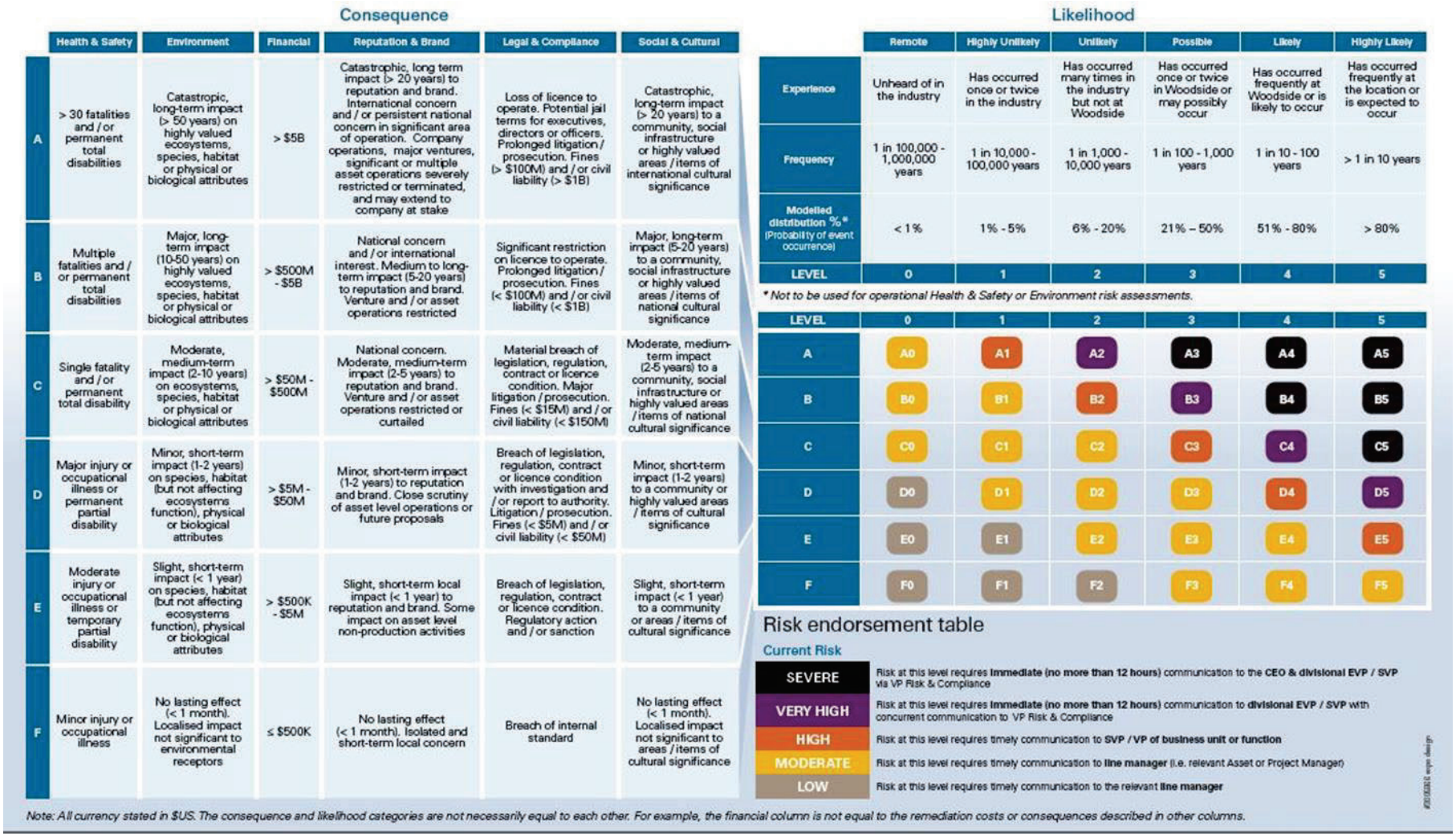

Figure 2-2: Environmental risk levels

2.3.3 Decision Support Framework

To support the risk assessment process Woodside's HSE risk management procedures include the use of a decision support framework based on principles set out in the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This concept has been applied during the ENVID or equivalent preceding processes during historical design decisions to determine the level of supporting evidence that may be required to draw sound conclusions regarding risk level and whether the risk is ALARP and acceptable. This is to confirm:

- activities do not pose an unacceptable environmental risk
- appropriate focus is placed on activities where the risk is anticipated to be acceptable and demonstrated to be ALARP
- appropriate effort is applied to the management of risks based on the uncertainty of the risk, the complexity and risk rating (i.e. potential higher order environmental impacts are subject to further evaluation assessment).

The framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the risk (referred to as Decision Type A, B or C). The decision type is selected based on an informed discussion around the uncertainty of the risk, then documented in ENVID output.

This framework enables Woodside to appropriately understand a risk, determine if the risk is acceptable and can be demonstrated to be ALARP.

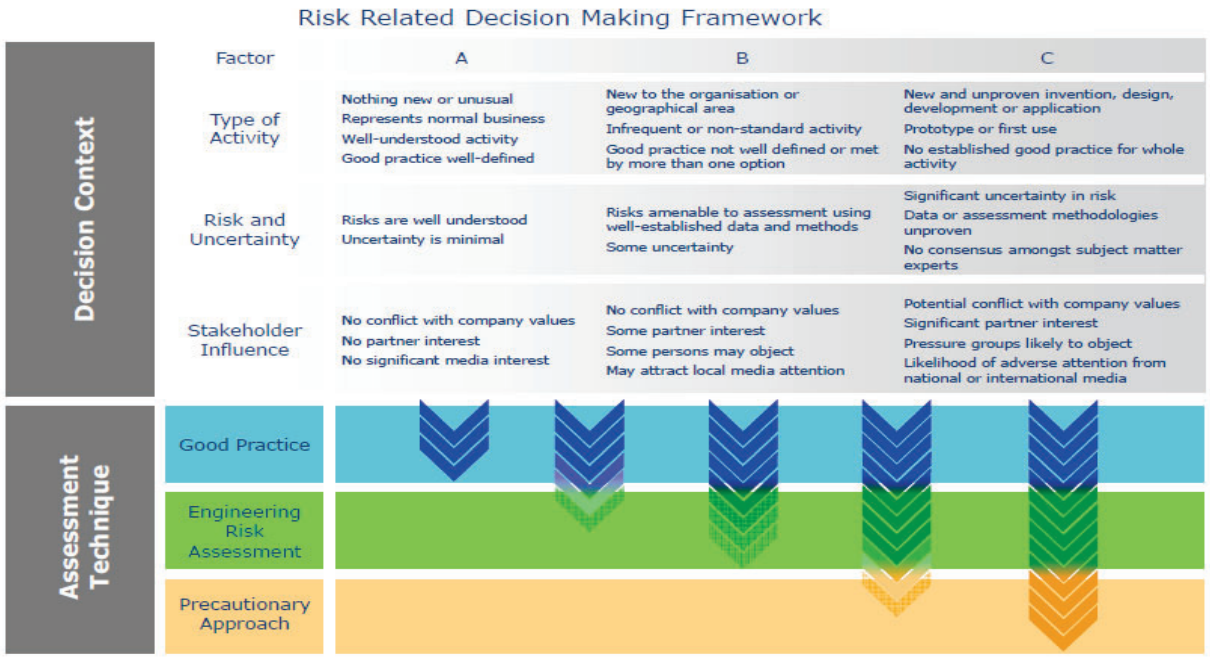

Figure 2-3: Risk related decision-making framework (Oil and Gas UK, 2014)

Decision Type A

Risks classified as a Decision Type A are well understood and established practice, they generally consider recognised good industry practice which is often embodied in legislation, codes and standards and use professional judgement.

Decision Type B

Risks classified as Decision Type B typically involve greater uncertainty and complexity (and can include potential higher order impacts/risks). These risks may deviate from established practice or

have some lifecycle implications, and therefore require further engineering risk assessment to support the decision and ensure the risk is ALARP. Engineering risk assessment tools may include:

- risk-based tools such as cost based analysis or modelling
- consequence modelling
- reliability analysis
- company values.

Decision Type C

Risks classified as a Decision Type C typically have significant risks related to environmental performance. Such risks typically involve greater complexity and uncertainty; therefore, requiring adoption of the precautionary approach. The risks may result in significant environmental impact; significant project risk/exposure or may elicit negative stakeholder concerns. For these risks, in addition to Decision Type A and B tools, company and societal values need to be considered by undertaking broader internal and external stakeholder consultation as part of the risk assessment process.

2.3.4 Demonstration of ALARP

Descriptions have been provided below (**Table 2-1**) to articulate how Woodside demonstrates different risks, impacts and Decision Types identified within the EP are ALARP.

Table 2-1: Summary of Woodside's criteria for ALARP demonstration

Risk	Impact	Decision Type
Low and Moderate	***Negligible, Slight, or Minor (D, E or F)***	***A***
Woodside demonstrates these Risks, Impacts and Decision Types are reduced to ALARP if: • controls identified meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines • further effort towards impact/risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.		
High, Very High or Severe	***Moderate and above (A, B or C)***	***B and C***
Woodside demonstrates these higher order Risks, Impacts and Decision Types are reduced to ALARP (where it can be demonstrated using good industry practice and risk-based analysis) that: • legislative requirements, applicable company requirements and industry codes and standards are met • societal concerns are accounted for • the alternative control measures are grossly disproportionate to the benefit gained.		

2.3.5 Demonstration of Acceptability

Acceptability of the Scarborough Project, including the Petroleum Activities Program described in this EP, was demonstrated in the Scarborough OPP (SA0006AF0000002, Rev 5) as required by Environment Regulation 5D (6). The EPOs set in the OPP demonstrate that the environment impacts and risks of the project will be managed to an acceptable level.

The impacts and risks of Scarborough were determined to be acceptable in the OPP through consideration of the following evaluation criteria (Scarborough OPP (SA0006AF0000002, Rev 5); Section 6.4.4)

- Principles of Ecologically Sustainable Development (ESD) as defined under the EPBC Act
- internal context – the proposed impacts and risk levels are consistent with Woodside policies, procedures and standards

- external context – consideration of the environment consequence and stakeholder acceptability
- other requirements – the proposed controls and impact and risk levels are consistent with national and international standards, laws, policies and Woodside Standards (including applicable plans for management and conservation advices, and significant impact guidelines for MNES)

In this EP Woodside has demonstrated that the level of acceptability determined in the OPP has been met through the following criteria:

- Adoption of relevant OPP EPOs and controls
- Adoption of EP specific controls where required
- Impact Significance Level / Risk Consequence levels for receptors are equal to or less than the significant impact level defined in the Scarborough OPP (SA0006AF0000002, Rev 5; Section 6.5; Table 6-3) and are therefore consistent with the EPOs and managed to an acceptable level of impact or risk, and
- Consideration of internal/external context and other requirements specific to this EP Petroleum Activities Program (including issues raised during EP Stakeholder Consultation).

A summary of the process as adopted is shown in **Table 2-2**.

Table 2-2: Summary of Woodside's criteria for Acceptability for Scarborough EPs

Risk	Impact	Decision Type
Low and Moderate	***Negligible, Slight, or Minor (D, E or F***	***A***
Woodside demonstrates these Risks, Impacts and Decision Types are 'Broadly Acceptable' if they meet the EP criteria listed above in **Section 2.4.4**. Further effort towards risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.		
High, Very High or Severe	***Moderate and above (A, B or C)***	***B and C***
Woodside demonstrates these higher order Risks, Impacts and Decision Types are 'Acceptable if ALARP' if they meet the EP criteria listed above in **Section 2.4.4**. In addition, these higher order risks, impacts and decision types are 'Acceptable if ALARP' if it can be demonstrated that the predicted levels of impact and/or residual risk, are managed to ALARP (as described in **Section 2.7.1**). For potential C or above consequence/impact levels where significant uncertainty exists in analysis of the risk or impact (such as, for predicted or potential high risk of significant environmental impacts, significant project risk/exposure, novel activities, lack of consensus on standards, and significant stakeholder concerns. (E.g. Decision Type C), defined acceptable levels and assessment of acceptability may be required to be conducted separately for key receptors.		

2.4 Recovery Plan and Threat Abatement Plan Assessment

To support the demonstration of acceptability, a separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer **Section 1.10.2.2**). The steps in this process are:

- identify relevant listed threatened species and ecological communities (**Section 4.6**; **Appendix I**);
- identify relevant recovery plans and threat abatement plans (**Appendix I**);
- list all objectives and (where relevant) the action areas of these plans, and assess whether these objectives/action areas apply to government, the Titleholder, and the Petroleum Activities Program (**Section 6.8**); and
- for those objectives/action areas applicable to the Petroleum Activities Program, identify the relevant actions of each plan, and evaluate whether impacts and risks resulting from the activity are clearly not inconsistent with that action (**Section 6.8**).

2.5 Environmental Performance Objectives/Outcomes, Standards and Measurement Criteria

The OPGGS Environment Regulations define EPOs to mean: "*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*". As such, the process of defining an appropriate EPO, has relied on the required levels of performance set either in legislation (such as the OPGGS Act), regulator guidance notes such as the Matters of National Environmental Significance–Significant Impact Guidelines (DotE, 2013) or may be the result of specific agreements or expectations with other relevant stakeholders (e.g. fishers or other marine users).

EPOs for the Scarborough Project have been set within the Scarborough OPP (SA0006AF0000002, Rev 5) and assessed as meeting the requirements of the Regulations to be appropriate, consistent with the principles of ecologically sustainable development and to demonstrate that the environmental impacts and risks of the project will be managed to an acceptable level.

Environment Plans for petroleum activities submitted subsequent to the OPP process are required to contain EPOs that are appropriate by being consistent with those set out in the OPP. The EPOs presented in a subsequent EP are not required to be exactly the same however should achieve the same environmental outcome (or better) as that described in the OPP. Activity specific EPs will also be required to contain measurement criteria and performance monitoring, auditing and reporting processes relating to the EPOs.

Table 6-1 shows a comparison between EPOs in the Scarborough OPP (SA0006AF0000002, Rev 5) and this EP.

3. DESCRIPTION OF THE ACTIVITY

3.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations and describes the activities to be undertaken as part of the Petroleum Activities Program under this EP. It includes the location of the activities, operational details and additional information relevant to considering environmental risks and impacts.

3.2 Project Overview

Woodside proposes to develop and produce hydrocarbons from the Scarborough field Permit Area WA-61-L.

The Petroleum Activities Program will involve drilling and installation of up to ten Scarborough development wells (eight planned wells and two contingency wells) and installation of a subsea xmas tree upon each well.

If required, Woodside may also need to intervene, workover or re-drill the proposed development wells within Permit Area WA-61-L to monitor and maintain their integrity and mechanically alter them as required.

An overview of the Petroleum Activities Program is provided in **Table 3-1**.

Table 3-1: Petroleum Activities Program Overview

Item	Description
Permit Titles	WA-61-L
Location	North West Shelf
Water depth	Approx. 900 m to 955 m
Number of wells	Scarborough development wells drilling and completions including: • eight development wells and the potential for two additional development wells (contingency).
Subsea infrastructure	Subsea xmas tree at each well
MODU	Dynamic Positioned (DP) MODU with contingency for moored MODU, depending on availability and suitability for the development well locations
Vessels	• Installation vessel for installing the subsea infrastructure. • Light well intervention vessel as an option for well intervention, subsea hardware installation or contingent activities. • Support vessels including anchor handling vessel(s) and general supply/support vessels.
Key activities	• Top hole section drilling. • Installation of blow-out preventer (and marine riser). • Bottom hole section drilling. • Completion and well unload activities. • Installation of subsea xmas trees. • Formation evaluation while drilling. • Temporary suspension or permanent abandonment of well (planned or if necessary, for unforeseen circumstances). • Contingent activities including pre-lay anchors by anchor handling vessel, anchor hold testing and mooring (in case of moored MODU); intervention, workover, well re-drill, wireline logging and installation of up to two additional development wells.

3.3 Concordance with the Scarborough OPP

The OPP describes the scope of the Scarborough project and its component activities, at a level comprehensive enough to facilitate thorough evaluation of environmental impacts and risks and appropriate setting of EPOs. However, in accordance with NOPSEMA guidance, it is acknowledged that an OPP is prepared at an early stage in project development, before detailed planning of component activities has occurred. More detailed descriptions of the component activities are therefore expected in subsequent EPs.

Refinement or modifications to methods or timing for individual project activities may occur after an OPP acceptance and before the submission of EPs. These refinements or modifications to the accepted project cannot be new activities and cannot significantly change the overall environmental impacts and risks of the project as described in the accepted OPP. Table 3-2 shows which scopes from the OPP may have progressed in level of definition from the time the OPP was authored.

Section 4 of the Scarborough OPP (SA0006AF0000002, Rev 5) provides a detailed description of the Scarborough project.

Table 3-2: Concordance of activities described in the Scarborough OPP with those included in this EP

Scarborough OPP Section	Scope or overview of the Activity	Relevance to this EP	Refinement or modification to methods	Refinement or modification to timing	Is this a new activity	Significance of change
4.4.3 Drilling Activities	Drilling of 7 Phase 1 Development wells	It is now proposed that 8 development wells be drilled as part of Phase 1, with potential for two additional contingent wells. This is within the scope of the total well count assessed by the OPP (30 wells) however is slightly more than the original estimate for the first drilling phase provided in Table 4-8 of the description of Drilling Activities.	No	Yes	No	No. Minor change in project execution phasing which does not affect impact or risk profile as it was assessed in the OPP.
Table 7-63 Well cuttings and fluid volumes discharged	Table 7-63 in the OPP estimates cuttings and fluid volumes that might be discharged for an example Scarborough well. The volumes quoted in Table 7-63 are described as "estimates only, for the purpose of undertaking an assessment of the environmental impacts. Detailed design will be undertaken further and the assessment updated in relevant activity EPs".	This EP provides an update on previous estimates of cuttings and fluid discharges during drilling activities, which were used in OPP risk assessment. The more recent estimation of cuttings and fluids are higher than original estimates due to refinement in well design - particularly some interval lengths have increased i.e. the 26" surface hole goes deeper into the Muderong, which will generate more cuttings, being a longer section of a larger hole.	Yes	No	No	No. Refer to Section 6.6.7 which shows overall environmental impact significance level is consistent with OPP assessment.
4.4.3.4 Bottom Hole Section Drilling	The OPP does not detail Formation Evaluation, which is carried out once well total depth is reached, to determine the presence and quantity of hydrocarbons in a reservoir. In Table 3-1 in the OPP which lists relevant legislation, it is noted that radioactive tracers may be used during formation evaluation. Well logging as an activity is included in the description of Well Intervention; with wireline listed as a specific example.	In this EP, Formation Evaluation While Drilling (FEWD) is proposed to be carried out, and may include extracting small cores, wireline logging, full diameter cores and other down-hole technologies, as required. Some FEWD tools contain radioactive sources, however, no radioactive material will be released to the environment and radiation fields are not generally detectable outside the tool when the tool is not energised, therefore, they do not present an environmental risk.	Yes	No	No	No. Because Formation evaluation is the interpretation of a combination of measurements taken inside a wellbore once total depth is reached, there are no specific environmental impacts from this activity.

3.4 Location

The Petroleum Activities Program is located in Permit Area WA-61-L in Commonwealth waters, about 374 km west-north-west of Dampier. The closest landfall to the Petroleum Activities Program is the North West Cape, about 226 km south-south-east at its nearest point (**Figure 3-1**). Approximate location details for the Petroleum Activities Program are provided in **Table 3-3**.

Table 3-3: Approximate location details for the proposed Scarborough development wells

Activity	Water depth (approx. m LAT)	Latitude (WGS84)	Longitude (WGS84)	Petroleum title(s)
New Development Wells				
Well 1	910	19° 53' 30.499" S	113° 08' 43.568" E	WA-61-L
Well 2	912	19° 53' 48.471" S	113° 06' 55.261" E	WA-61-L
Well 3	912	19° 53' 18.551" S	113° 10' 03.300" E	WA-61-L
Well 4	918	19° 52" 30.359" S	113° 06' 41.412" E	WA-61-L
Well 5	918	19° 52' 38.718" S	113° 13' 24.437" E	WA-61-L
Well 6	902	19° 49' 27.763" S	113° 13' 08.300" E	WA-61-L
Well 7	907	19° 45' 52.900" S	113° 14' 27.449" E	WA-61-L
Well 8	909	19° 53' 27.254" S	113° 08' 43.647"E	WA-61-L
Contingent wells	Within permit area WA-61-L			

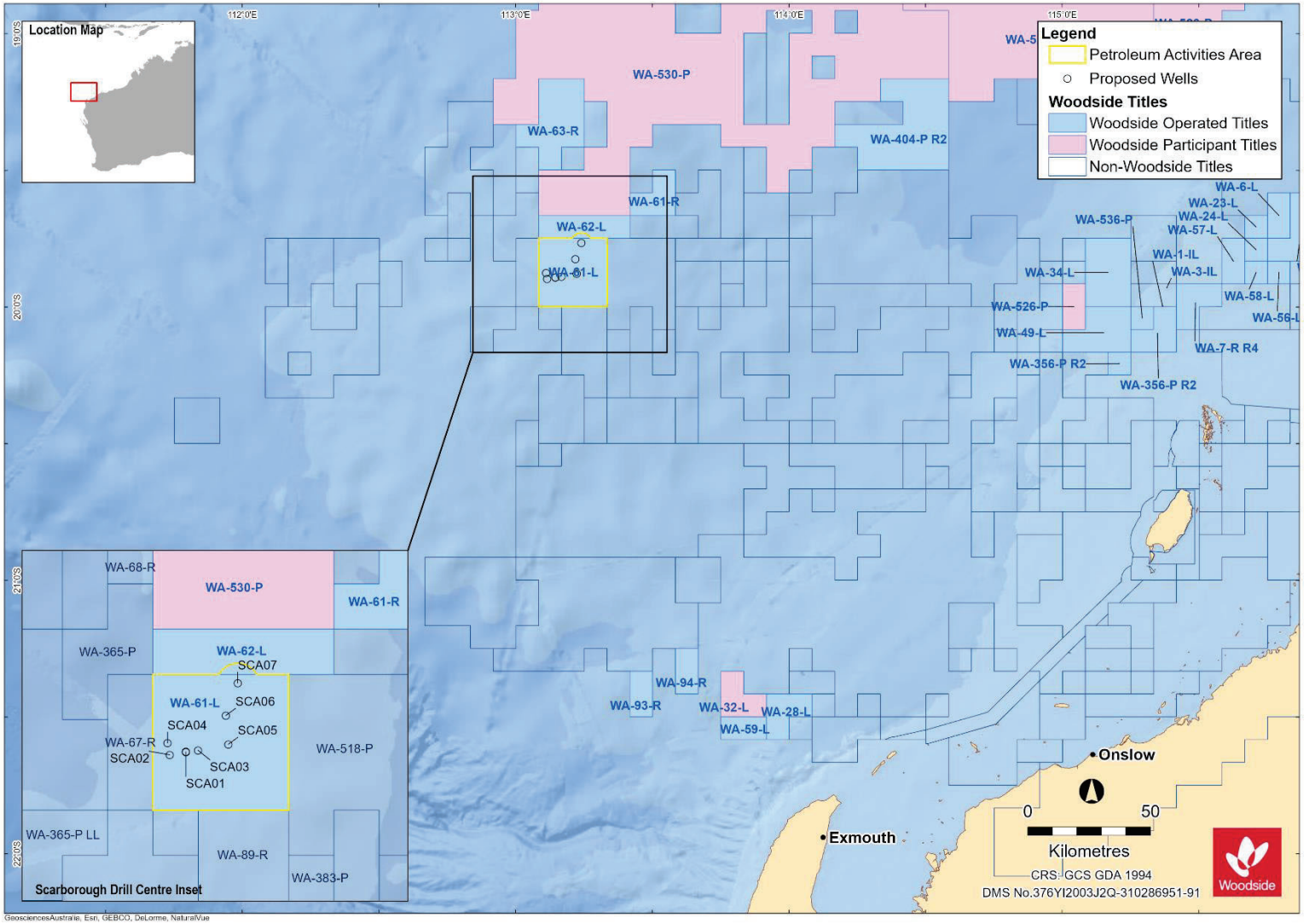

Figure 3-1: Location of the Petroleum Activities Program

3.5 Operational Areas

The spatial boundary of the Petroleum Activities Program has been described and assessed using two 'areas', the Operational Area and the Permit Area[1]. The combination of the Operational Area and Permit Area defines the spatial boundary of the Petroleum Activities Program, as described and risk assessed by this EP, including vessel related petroleum activities. For the purposes of this EP, the following Operational Areas will apply:

- For a dynamically positioned (DP) MODU, the Operational Area encompasses a radius of 500 metre (m) from each well centre, in which drilling related petroleum activities will take place and will be managed under this EP.
- For a moored MODU, the Operational Area encompasses a radius of 4000 m from each well centre, in which drilling related petroleum activities will take place and will be managed under this EP. This increased Operational Area allows for temporary installation of moorings. Noting that the Operational Area will be limited to the western boundary of Permit Area WA-61-L.
- For the installation activities, the Operational Area encompasses a radius of 1500 m around subsea locations, in which subsea installation activities will take place and will be managed under this EP. The 1500 m (radius) Operational Area around subsea installation allows for the movement and positioning of large vessels.

The Operational Area for drilling activities includes a 500 m petroleum safety zone around the MODU to manage vessel movements. The 500 m petroleum safety zone is under the control of the MODU Person in Charge.

The Operational Area and Permit Area are collectively referred to as the Petroleum Activity Area (PAA) in this EP, with specific Operational Areas referred to where relevant. Vessel-related activities within the Operational Areas will comply with this EP. Vessels supporting the Petroleum Activities Program when outside the Operational Area must adhere to applicable maritime regulations and other requirements.

3.6 Timing

The Petroleum Activities Program is planned to commence within a five-year window, with potential commencement date of H2 2022. Drilling may occur at any time within the five-year period between 2022 and 2027, for which this EP will be active. Wells may not be drilled consecutively (i.e. one well may be drilled and then the program stopped for 12 or more months before recommencing with further wells). Drilling operations for the development wells is expected to take approximately 60 days per well to complete, including mobilisation, demobilisation and contingency. Subsea xmas trees are expected to be installed after completing the relevant sections of the well while the MODU is still in the field. Installation of subsea xmas trees is expected to have a cumulative duration of about 14 days (including mobilisation, demobilisation, and contingency).

When underway activities will be 24 hours per day, seven days per week. Simultaneous Operations (SIMOPS) activities may occur (e.g. drilling and xmas tree installation, with MODU and vessel separated by at least 1 km). Timing and duration of all activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather.

The EP has risk-assessed drilling activities, installation of subsea infrastructure, IMR, support operations and contingency activities such as intervention, workover, or re-drilling activities

[1] For the purposes of this EP the Permit Area comprises WA-61-L plus a buffer to incorporate the portion of the Operational Area that extends beyond the north boundary of the Permit Area (Figure 3-2). The existing environment of the entire Permit Area plus the defined buffer is considered to provide context for the risk assessment. This approach facilitates assessing environmental risks and impacts for the entire scope, including development drilling of the contingency wells with a moored MODU.

throughout the year (all seasons) to provide operational flexibility for requirements and schedule changes and MODU/vessel availability.

3.7 Drilling Activities

Well construction activities are conducted in a number of stages, as described below. Detailed well designs will be submitted to the Well Integrity Department of NOPSEMA as part of the approval to drill and the accepted Well Operation Management Plan (WOMP), as required under the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

3.7.1 Drilling Operations

3.7.1.1 Cement Unit Test

The MODU may be required to perform a cement unit test, or 'dummy cement job' to test the functionality of the cement unit and the MODU's bulk cement delivery system prior to performing an actual cement job. This operation is usually performed after a MODU has been out of operation for an amount of time (warm-stack), if maintenance on the cement unit has been carried out, or if it is the first time a MODU is being used in-country and commissioning of the cement unit system is required.

A 'dummy cement job' involves mixing a sacrificial cement slurry at surface and, once functionality of the cement unit and delivery system has been confirmed, the slurry is discharged through the usual cement unit discharge line (which may be up to 10 m above the sea level) or through drill pipe below sea level. The slurry is usually a mix of cement and water, however, may sometimes contain stabilisers or chemical additives.

3.7.1.2 Top-Hole Section Drilling

Petroleum Activities Program drilling commences with the top-hole section as follows:

1. The MODU arrives and establishes position over the well site.
2. Top-hole sections are drilled riserless using seawater with pre-hydrated bentonite/guar gum or similar sweeps or drilling fluids to circulate drilled cuttings from the wellbore (discharge to seabed during riserless drilling). As a contingency Pump and Dump (PAD) water-based mud may be used if required based on shallow hazards.
3. Once the top-hole sections of the well have been drilled, steel tubulars (called conductor or casing) are inserted into the wellbore and secured in place by pumping cement into the annular space back to about 300 m above the casing shoe or to surface (seabed), which will involve a discharge of excess cement at the seabed.

At some well locations, top-hole section drilling may be batched. Batch drilling is where the same section of each well is drilled one after another, before going back and drilling the next section of each well.

3.7.1.3 Blowout Preventer and Marine Riser Installation

After setting the surface casing, a blowout preventor (BOP) and marine riser is installed on the wellhead. The BOP provides a means for sealing, controlling and monitoring the well during drilling activities. The BOP components are operated using open hydraulic systems (utilising water-based BOP control fluids). Each time a pressure and function test schedule is undertaken approximately 3620 L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive. BOP operation includes function and pressure testing approximately every 21 days,

and a function test (approx. 2665 L) approximately every seven days, excluding the week a pressure test is conducted.

The marine riser provides a physical connection between the well and MODU. This enables a closed circulation system to be maintained, where weighted water-based muds (WBM) and cuttings can be circulated from the wellbore back to the MODU via the riser.

3.7.1.4 Bottom Hole Section Drilling

A closed system (riser in place), is used for drilling bottom hole sections to the planned wellbore total depth. The plan is for bottom hole sections to be drilled using WBM drilling fluids; however, non water-based mud (NWBM) may also be used.

Protective steel tubulars (casings and liners) are inserted as required. The size, grade, weight, length and inclination of the casing/liner sections within the wellbore is determined by factors such as the geology/subterranean pressures likely to be encountered in the area and any specific information or resource development requirements.

After a string of casing/liner has been installed into the wellbore, it is cemented into place. The casing/liner is then pressure tested. Once the pressure testing is passed, drilling of the next section can resume with the riser in place to circulate drill cuttings and drilling fluids back to the MODU.

Cementing operations are also undertaken to:

- provide annular isolation between hole sections and structural support of the casing/liner as required
- set a plug in an existing well to side-track
- plug a well so it can be suspended/abandoned.

Cement, barite and bentonite is transported as dry bulk to the MODU by the support vessels. Cement is mixed as required by the cementing unit on the MODU and pumped by high pressure pumps to the surface cementing head then directed down the well.

Excess cement, barite and bentonite (dry bulk) after well operations are completed, will either be held onboard and used for subsequent wells; provided to the next operator at the end of the program or discharged to the marine environment. Excess cement, barite and bentonite that does not meet technical requirements during the Petroleum Activities Program may also be bulk discharged to the environment. Bulk discharges of cement, barite and bentonite may occur as a slurry through the usual cement discharge line or blown as dry bulk and discharged.

Cuttings in drilling fluids circulated back to the MODU are separated from the drilling fluids by the solids control equipment (SCE). The SCE comprises shale shakers to remove coarse cuttings from the drilling fluid. After processing by the shale shakers, the recovered fluids from the cuttings may be directed to centrifuges, which are used to remove the finer solids (4.5 to 6 µm). Water-based drill cuttings are usually discharged below the water line and the fluids are recirculated into the fluid system.

3.7.1.5 Drilling Fluids

In addition to the base fluid, drilling muds contain a variety of chemicals, incorporated into the selected drilling fluid system to meet specific technical requirements (e.g. mud weight required to manage pressure, or for borehole stability). All chemicals selected for use have been assessed under Woodside's internal guidelines to ensure potential impacts are acceptable, ALARP and meet Woodside's expectation for environmental performance.

3.7.1.6 Water-Based (WBM) System

The Petroleum Activities Program will use a water-based drilling fluid system as the planned option. WBM is mainly comprised of water (salt or fresh). Some basic additives such as bentonite/guar gum may be added to the water.

The WBM drilling fluid will either be mixed on the MODU or received pre-mixed, then stored and maintained in a series of pits aboard the MODU. The top-hole sections will be drilled riserless with seawater containing pre-hydrated gel sweeps, and cuttings and drilling fluids returned to the seabed. The bottom hole sections may be drilled using WBM in a closed circulation system which enables re-use of the WBM drilling fluids.

WBM drilling fluids that cannot be reused (e.g. due to bacterial deterioration or do not meet required drilling fluid properties), or are mixed in excess of required volumes, may be operationally discharged to the ocean under the MODU's Permit to Work (PTW) system. Opportunities to reuse the WBM drilling fluids at the end of the Petroleum Activities Program are reviewed across current Woodside drilling activities.

WBM may not be able to be reused between drilling sections due to the drilling sequence, technical requirements of the mud (i.e. no tolerance for deterioration of mud during storage) and maintenance of productivity/injectivity.

A number of factors unique to each drilling program will determine the quantities of WBM drilling fluids required and subsequent discharge volumes if no suitable reuse option is available.

3.7.1.7 Non Water-Based Mud System (Contingency only)

The decision to use non water-based muds (NWBM) drilling fluids for the bottom hole sections of a particular well is based on various technical factors relevant to wellbore conditions, such as: well temperature, well shape and depth, reactivity of the formation to water and well friction. The technical justification to use NWBM includes but is not limited to consideration of environment, health, safety and waste management.

The use of NWBM drilling fluids is subject to a formal written commercial and/or technical justification approved in accordance with the Best Practice – Overburden Drilling Fluids Environmental Requirements. The main ingredient of NWBM is base oil and, similar to a WBM system, a range of standard solid and liquid additives may be added in the pits to alter specific mud properties for each section of the well. This depends on the conditions encountered while drilling. Where NWBM is used, the base oil will be a Group III synthetic oil (e.g. Saraline 185V), for all development wells.

The NWBM drilling fluid will be primarily mixed onshore (new or re-use existing stock) and transferred to the MODU by a support vessel, where it is stored and maintained in the mud pits. During drilling operations, the NWBM drilling fluid, like the WBM, is pumped by high pressure pumps down the drill string and out through the drill bit, returning via the annulus between the drill string and the casing back to the MODU via the riser.

The used NWBM pumped back to the MODU contains drill cuttings and is pumped to the Solids Control Equipment (SCE), where the drill cuttings are removed before being pumped back to the pits ready for re-use. The technical properties of the NWBM drilling fluids are maintained/altered (e.g. to increase weight) using additives as required when in the mud pits.

The NWBM drilling fluids that cannot be re-used (i.e. do not meet required drilling fluid properties or are mixed in excess of required volumes) are recovered from the mud pits and returned to the shore base for onshore processing, recycling and/or disposal. The mud pits and associated equipment/infrastructure are cleaned when NWBM is no longer required, with wash water treated onboard through SCE prior to discharge with mud pit washings or returned to shore for disposal if discharge criteria cannot be achieved (refer to mud pits below).

3.7.1.8 Mud Pits

There are typically a number of mud pits (tanks) on the MODU that provide a capacity to mix, maintain and store fluids required for drilling activities. The mud pits form part of the drilling fluid circulating system. The mud pits and associated equipment/infrastructure are cleaned out at the completion of drilling and completions operations. Mud pit wash residue is operationally discharged with less than 1% oil contamination by volume. Mud pit residue over 1% oil by volume is sent to shore for disposal.

3.7.1.9 Drill Cuttings

Drill cuttings generated from the well are expected to range from very fine to very coarse (less than 1 cm) particle/sediment sizes. Cuttings generated during drilling of the top hole sections are discharged at the seabed. Estimated volumes of drill cuttings that may be discharged during the Petroleum Activities Program are presented in **Table 6-7.**

The bottom hole sections will be drilled with a marine riser that enables cuttings and drilling fluid to be circulated back to the MODU, where the cuttings are separated from the drilling fluids by the SCE. The SCE comprises but is not limited to shale shakers, cuttings dryers and centrifuges. The SCE uses shale shakers to remove coarse cuttings from the drilling mud. After being processed by the shale shakers, the recovered mud from the cuttings may be directed to centrifuges, which are used to remove fine solids (4.5 to 6 µm). The cuttings are usually discharged below the water line and the mud is recirculated into the fluid system.

If NWBM is needed to drill a well section, the cuttings which are separated from the NWBM via the shakers will also pass through a cuttings dryer and associated SCE, to reduce the average oil on cuttings (only sections using NWBM) to 6.9% wt/wt or less on wet cuttings, prior to discharge.

3.7.2 Formation Evaluation

Formation evaluation is the interpretation of a combination of measurements taken inside a wellbore to detect and quantify hydrocarbon presence in the rock adjacent to the well once total depth is reached. Formation Evaluation While Drilling (FEWD) is the process by which the presence and quantity of hydrocarbon in a reservoir is measured according to its response to radioactive and electrical input. It may include extracting small cores, wireline logging, full diameter cores and other down-hole technologies, as required. FEWD tools will be incorporated into the drillstring during development drilling and may include gamma ray, directional deep resistivity, callipers, density-neutron, sonic and tools which can measure formation pressures. Some FEWD tools contain radioactive sources, however, no radioactive material will be released to the environment and radiation fields are not generally detectable outside the tool when the tool is not energised, therefore, they do not present an environmental risk.

3.7.3 Well Clean-out

Prior to installing the lower completion, wells will be displaced from one drilling fluid system to another, or from the drilling fluid system to completion brine. A chemical cleanout pill or fluids train will be circulated between the two fluids, then seawater or brine circulated until operational cleanliness specifications are met. Brine is typically a filtered brine with <70 NTU or <0.05% total suspended solids (TSS). This results in a brine and seawater discharge after this operation. Cleanout fluids and completion brine will be captured and stored on the MODU and discharged if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met.

3.7.4 Completion

Once a well has been drilled, well completion activities will be undertaken including installation of the lower completion, intermediate completion, upper completion / production tubing, and subsea tree. The well is then pressure tested for integrity prior to well unloading and suspension. Lower completion will be an open hole gravel pack with a viscous water-based fluid.

The wells will be completed with a big bore upper completion. Following unloading, wells will be suspended with a gas column and two crown plugs installed in the tubing hanger. Crown plugs will be individually pressure tested to verify as suspension barriers prior to the BOP being removed.

3.7.5 Well Flowback

3.7.5.1 General Description

Upon successfully drilling the development wells, all completion and reservoir fluids will be flared or discharged to the environment via the temporary production system. The types of tasks associated with well testing and flowback may include:

- reservoir gas flaring
- reservoir gas venting.

During well flowback activities, all completion and reservoir fluids will be flared or discharged to the environment via the temporary production system. Base oil will be used to underbalance the well. The base oil column, completion fluids, hydrocarbons and produced/condensed water will be treated for overboard discharge if it meets discharge requirements or flared/burned through the temporary production system on the MODU.

3.7.5.2 Produced / Reservoir Water Disposal

The temporary production system water filtration treatment package will be used to treat produced/reservoir water before discharge. Prior to discharging, the fluids are cycled through an oilbond filtration system and gauge tank. Water filtration is standard practice for well unloading operations. Fluids that cannot be treated or flared will be sent onshore in tanks for disposal.

3.7.6 Air Emissions

During well unloading it is expected that gas, condensate, base oil and methanol in the wellbore will be flared and efficiently burned. The flare may be extinguished due to water ingress, lack of pilot (propane), weather impact or equipment failure resulting in cold venting of gas from the flare for several minutes, before the flare can be restarted or venting stopped. After the objectives of the well testing and flowback are achieved, the flow is stopped and the well may be cleaned using a brine that can include several chemicals, such as biocide and surfactant.

3.7.7 Subsea Equipment Preservation Chemicals

Following well completion activities, the wells may be left with subsea equipment (such as xmas trees) installed, awaiting pre-commissioning and connection to the Floating Production Unit (FPU). All subsea equipment will contain preservation fluids to prevent corrosion and any other deterioration of the equipment before production.

3.7.8 Well Suspension

During drilling activities, wells will be temporarily suspended due to batch drilling. Suspension involves establishing suitable barriers, removing the riser and disconnecting the MODU from the well. The BOP may sometimes be left in place to act as a barrier. Suspension may be short term (e.g. in the case of a cyclone) or longer term (more than one year) following well unloading. On return

to a well following suspension, the MODU reconnects to the well via the riser, and with BOP in place, barriers are removed and drilling and completions activity resumes.

3.7.9 Underwater Acoustic Positioning

An array of long base line (LBL) transponders may be installed on the seabed as required to support drilling activities. The LBL array provides accurate positioning by measuring ranges to three or more transponders deployed at known locations on the seabed and structures.

An array of transponders is proposed within a radius of 500 m from the proposed location of the wells and will be in place for a period of about three months per well. Transmissions are not continuous but consist of short 'chirps' with a duration that ranges from 3 to 40 milliseconds. Transponders will not emit any sound when on standby and are planned to only actively emit sound for about six hours per well. When required for general positioning, they will emit one chirp every five seconds (estimated to be required for four hours at a time). When required for precise positioning, they will emit one chirp every second (estimated to be required for two hours at a time).

During xmas tree installation activities ultra-short baseline transponders (USBL) may be installed on the seabed or mounted to the wellhead as required by the sub-sea installation activities. Transmissions from USBL transponders are similar to LBL transponders.

Transponders may be moored to the seabed either by a clump weight or mounted on a seabed frame. The standard clump weights used, made of cement or steel, will likely weigh about 80 kilogram (kg). A typical seabed frame is 1.5 m × 1.5 m × 1.5 m in dimension and weighs about 40 kg. On completion of the positioning operation, the array transponders moored by clump weight are recovered by means of a hydrostatic release, which leaves the clump weight on the seabed. The transponders mounted on seabed frames will be removed by ROV.

3.7.10 Installation of Subsea Infrastructure

The subsea installation scope of work comprises the installation of subsea xmas trees. The dimensions of the xmas trees will be approximately 5 x 5 x 5 m (Length x Width x Height).

Prior to the upper completion being installed into the wells, the xmas trees will be installed from an installation vessel in SIMOPS with the MODU, or directly from the MODU. Due to the subsea well layout, if installation was to occur from the installation vessel, the MODU will be required to kedge off or reposition away from the drill centre to allow the installation vessel to install the xmas trees. The xmas trees will be suspended vertically approximately 10 m off the sea floor. Once the xmas trees have been installed, they will be pressure tested to confirm integrity before the MODU BOP is reconnected to continue with drilling and completions activities.

The xmas trees will be installed with a preservation mixture in the production and annulus bores. There will be a small discharge of preservation fluid associated with testing and connection the subsea system (estimated 100 to 150 L per well).

3.8 Project Fluids

3.8.1 Assessment of Project Fluids

All chemicals that may be operationally released or discharged to the marine environment by the Petroleum Activities Program are evaluated using a defined framework and set of tools to ensure the potential impacts are acceptable, ALARP and meet Woodside's expectation for environmental performance.

All approved drilling and completion chemicals are included on the Drilling and Completions – Master Chemical List which is periodically reviewed to drive continuous environmental improvement.

The chemical assessment process follows the principles outlined in the Offshore Chemical Notification Scheme (OCNS) which manages chemical use and discharge in the United Kingdom (UK) and the Netherlands. It applies the requirements of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). The OSPAR Convention is widely accepted as best practice for chemical management.

All chemical substances listed on the OCNS ranked list of registered products have an assigned ranking based on toxicity and other relevant parameters, such as biodegradation and bioaccumulation, in accordance with one of two schemes (as shown in **Figure 3-2**):

- Hazard Quotient (HQ) Colour Band: Gold, Silver, White, Blue, Orange and Purple (listed in order of increasing environmental hazard), or
- OCNS Grouping: E, D, C, B or A (listed in order of increasing environmental hazard). Used for inorganic substances, hydraulic fluids and pipeline chemicals only.

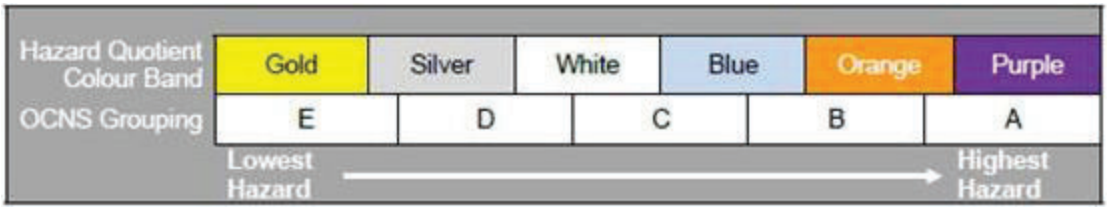

Figure 3-2: OCNS ranking scheme

Chemicals fall into the following assessment types:

- No further assessment: Chemicals with an HQ band of Gold or Silver or an OCNS ranking of E or D with no substitution or product warnings do not require further assessment. Such chemicals do not represent a significant impact on the environment under standard use scenarios and are, therefore, considered ALARP and acceptable.
- Further assessment/ALARP justification required: The following types of chemicals require further assessment to understand the environmental impacts of discharge into the marine environment:
    - chemicals with no OCNS ranking
    - chemicals with an HQ band of White, Blue, Orange, Purple or an OCNS ranking of A, B or C
    - chemicals with an OCNS product or substitution warning.

3.8.1.1 Further Assessment/ALARP Justification

This includes assessing the ecotoxicity, biodegradation and bioaccumulation of the chemicals in the marine environment in accordance with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Hazard assessment and the Department of Mine and Petroleum (DMP) Chemical Assessment Guide: *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline.*

3.8.1.2 Ecotoxicity

Chemical ecotoxicity is assessed using the criteria used by CEFAS to group chemicals based on ecotoxicity results (**Table 3-6**). If a chemical has an aquatic or sediment toxicity within the criteria for the OCNS grouping of D or E this is considered acceptable in terms of ecotoxicity.

Table 3-4: CEFAS OCNS grouping based on ecotoxicity results

Initial grouping	A	B	C	D	E
Results for aquatic-toxicity data (ppm)	<1	>1-10	>10-100	>100-1000	>1000
Result for sediment toxicity data (ppm)	<10	>10-100	>100-1000	>1000-10,000	>10,000

Note: Aquatic toxicity refers to the Skeletonema constatum EC50, Acartia tonsa lethal concentration 50% (LC_{50}) and Scophthalmus maximus (juvenile turbot) LC_{50} toxicity tests; sediment toxicity refers to Corophium volutator LC_{50} test

Biodegradation

The biodegradation of chemicals is assessed using the CEFAS biodegradation criteria, which align with the categorisation outlined in the DMP Chemical Assessment Guide: *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline*.

CEFAS categorises biodegradation into the following groups:

- Readily biodegradable: results of >60% biodegradation in 28 days to an OSPAR harmonised offshore chemical notification format (HOCNF) accepted ready biodegradation protocol.
- Inherently biodegradable: results >20% and <60% to an OSPAR HOCNF accepted ready biodegradation protocol or result of >20% by OSPAR accepted inherent biodegradation study.
- Not biodegradable: results from OSPAR HOCNF accepted biodegradation protocol or inherent biodegradation protocol are <20%, or half-life values derived from aquatic simulation test indicate persistence.

Bioaccumulation

The bioaccumulation of chemicals is assessed using the CEFAS bioaccumulation criteria, which align with the categorisation outlined in the DMP Chemical Assessment Guide*: Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline*.

The following guidance is used by CEFAS:

- Non-bioaccumulative: LogPow <3, or BCF ≤100 and molecular weight is ≥700.
- Bioaccumulative: LogPow ≥3 or BC >100 and molecular weight is <700.

If a product has no specific ecotoxicity, biodegradation or bioaccumulation data available, the following options are considered:

- Environmental data for analogous products can be referred to where chemical ingredients and composition are largely identical. OR
- Environmental data may be referenced for each separate chemical ingredient (if known) within the product.

Alternatives

If no environmental data is available for a chemical or if the environmental data does not meet the acceptability criteria outlined above, potential alternatives for the chemical will be investigated, with preference for options with an HQ band of Gold or Silver, or OCNS Group E or D with no substitution or product warnings.

If no more environmentally suitable alternatives are available, further risk reduction measures (e.g. controls related to use and discharge) will be considered for the specific context and implemented where relevant to ensure the risk is ALARP and acceptable.

Decision

Once the further assessment/ALARP justification has been completed, the relevant environment adviser must concur that the environmental risk as a result of chemical use is ALARP and acceptable.

3.9 Subsea Inspection, Maintenance, Monitoring and Repair Activities

Subsea infrastructure is designed not to require any significant degree of intervention. However, the infrastructure is inspected and maintained to ensure its integrity and identify any issues before they present a risk of loss of containment. Intervention may be required to repair identified issues. Subsea activities are typically performed from a relevant support vessel via an ROV or divers.

Interventions often require deployment frames/baskets, which are temporarily placed on the seabed. Typically, these have a perforated base with a seabed footprint of about 15 m². They are recovered to the vessel at the end of the activity. Subsea activities are broadly categorised into inspection, monitoring, maintenance and repair; typical IMMR activities are described in the next sections.

3.9.1 Inspection

Subsea infrastructure inspections physically verify and assess components to detect changes to the as-installed location and condition by comparing them to previous inspections. The scope and frequency of subsea inspections are determined using risk-based inspection (RBI) methodology, resulting in detailed RBI plans. **Table 3-5** lists typical relevant subsea infrastructure inspections/surveys.

Table 3-5: Typical inspections/surveys

Type of Inspection/Survey	Purpose
General visual inspections	Check general infrastructure integrity
Close visual inspections	Investigate certain subsea infrastructure components
Cathodic protection	Check for corrosion
Wall thickness surveys	Monitor the condition of subsea infrastructure. (i.e. ultrasonic testing)
Non-destructive testing	Evaluate the properties of material/items using electromagnetic, radio graphic, acoustic resonance technology, ultrasonic, or magnetic equipment
Anode sampling	Take samples of anode materials for testing
Marine growth sampling	Take samples of marine growth for testing
Laser surveys	Conduct dimensional checks on trees etc. and measure proximity

Inspection methods will not directly result in environmental aspects which could lead to impacts on the environment and are therefore not discussed further. Potential impacts from vessel and ROV operations associated with inspections are described in **Section 3.10.4**.

3.9.2 Monitoring

Subsea infrastructure monitoring surveys the physical and chemical environment that a subsea system or component is exposed to, to determine if and when damage may occur, and (where relevant) predict the rate or extent of that damage.

Monitoring activities may include corrosion probes, corrosion mitigation checks, metocean and seismic monitoring, and cathodic protection testing.

Monitoring will not directly result in environmental aspects which could lead to impacts on the environment and are therefore not discussed further. Potential impacts from vessel and ROV operations associated with monitoring are described in **Section 3.10.4**.

3.9.3 Maintenance and Repair

Maintenance activities on subsea infrastructure are required at regular or planned intervals to prevent deterioration or integrity failure. Maintenance activities may include cycling and actuating valves, flushing chemical/hydraulic fluid lines, and leak and pressure testing.

Repair activities are required when a subsea system or component is degraded, damaged, or has deteriorated to a level outside acceptance limits. Damage sustained may not necessarily pose an immediate threat to continued system integrity, but presents an elevated level of risk to safety, environment, or production. Typical subsea repair activities include:

- xmas tree or component/cap repair and/or replacement
- corrosion protection.

Some environmental discharges are expected during subsea maintenance and repair activities. **Table 3-6** lists typical discharge volumes during different maintenance and repair activities.

Table 3-6: Typical discharge volume during maintenance and repair activities

Activity	Typical Discharge
Pressure/leak testing	Chemical dye >10 L
Valve functioning	0.5 L to 5 L per valve actuation
Flushing	Residual hydrocarbon or chemical releases volume depends on injection port size, component geometry, and pumping rates
Hot stab changeout	Hydrocarbons or control fluid <10 L.
Xmas tree repair, replacement, and recovery	Typical release of hydrocarbon or other chemicals depends on equipment configuration and flushing ability. This will be subject to an ALARP determination for the activity, as per normal practice.

Excess marine growth may need to be removed before undertaking subsea IMR activities and/or following return to wells after a period of suspended drilling. An ROV is used for this activity; **Table 3-7** lists the different techniques used.

Table 3-7: Marine growth removal

Activity/Equipment	Description
Water jetting	Uses high-pressure water to remove marine growth
Brush systems	Uses brushes attached to an ROV to physically remove marine growth
Acid	Chemically dissolves calcium deposits

If sediment builds up around subsea infrastructure, an ROV-mounted suction pump/dredging unit may be used to move small amounts of sediment in the immediate vicinity of the subsea infrastructure (i.e. within the existing footprint) to allow inspection/intervention works to be undertaken. Sediment relocation typically results in minor seabed disturbance and some localised turbidity.

3.10 Project Vessels and Support Activities

3.10.1 MODU Operations

The Petroleum Activities Program will be drilled by a MODU. This is planned to be a DP MODU, with risks assessed in this EP for a moored MODU as a contingency. Typical specifications for these MODU types are provided in **Table 3-7** and **Table 3-8** respectively. These are collectively referred to as the MODU for the remainder of the document, unless specific risks for different MODU types

have been identified. Due to variabilities, such as contractual and operational matters, the MODU used may be subject to change.

Table 3-8: Typical DP MODU specifications (Valaris DPS-1)

Component	Specification Range
Rig type / Design / Class	Ultra deepwater semi-submersible MODU
Accommodation	200 persons
Station keeping	Dynamically positioned
Bulk mud and cement storage capacity	1000 m^3
Liquid mud storage capacity	2663 m^3
Fuel oil storage capacity	3640 m^3
Drill water storage capacity	3482 m^3

Table 3-9: Typical moored MODU specification ranges (Ocean Apex)

Component	Specification Range
Rig type/design/class	Semi-submersible MODU
Accommodation	120 to 200 personnel (maximum persons on board)
Station keeping	Minimum eight-point mooring system
Bulk mud and cement storage capacity	283 to 770 m^3
Liquid mud storage capacity	576 to 2500 m^3
Fuel oil storage capacity	966 to 1400 m^3
Drill water storage capacity	3500 m^3

3.10.2 Vessel Operations

Vessels used during the Petroleum Activities Program include a installation vessel and subsea support vessels, with other vessels likely to be used to support MODU and vessel operations including general support vessel(s) and anchor handling vessel(s).

Vessels may mobilise from the nearest Australian port or directly from international waters to the Petroleum Activity Area (PAA), in accordance with biosecurity and marine assurance requirements.

All project vessels are subject to the Marine Offshore Vessel Assurance procedure which is detailed in Implementation **Section 7.5.2.3**.

3.10.2.1 Installation Vessel

The Petroleum Activities Program subsea installation scopes of work may require an installation vessel with enough capacity to accommodate hardware and equipment including the xmas trees.

A typical installation vessel would be a DP vessel (usually DP2 Class) equipped with a primary differential global surface positioning system (DGPS) and an independent secondary DGPS backup system. The specification of a typical subsea installation vessel is provided in **Table 3-10**.

Installation vessels are typically equipped with a variety of material handling equipment, which includes cranes, winches, ROVs and ROV Launch and Recovery Systems (LARS), Vertical Lay System (VLS) with either vertical reel drive or horizontal drive (carrousel) and pre-commissioning spread.

Lifting operations may involve loading and unloading of equipment from support and supply vessels onto the installation vessel and subsequently onto the seabed. Cranes are typically equipped with

active heave compensation and auto tension modes and have lifting capacities in excess of expected lifting loads to be encountered during operations.

Table 3-10: Typical DP 2 Class subsea installation vessel specifications for MMA Pinnacle

Component	Specification Range
Vessel Type	DP 2 Class as minimum
Crane Capacity	150 T HMC
Deck Space	About 1000 m^2
Deck Strength	About 10 T/m^2
Accommodation	About 100 people
Fuel Oil	About 868 m^3
Potable Water	About 586 m^3

3.10.2.2 Subsea Support Vessel

During the Petroleum Activities Program, a subsea support vessel for light well intervention (LWI) operations may be used as an option for contingent well intervention, subsea installation, subsea inspection maintenance and repair and other activities. Vessels supporting offshore activities may vary depending on requirements, vessel schedules, capability and availability.

Typical support vessels use a DP system to allow manoeuvrability and avoid anchoring when undertaking works. However, vessels are equipped with anchors which may be deployed in an emergency.

An example of this vessel type is the *Sapura Constructor*, which is a 117 m long subsea support vessel equipped with a saturation dive system, two work class remotely operated vehicles (ROV), well intervention equipment, a helideck, moon pool and accommodation for 120 personnel. The final vessel selection, if required, will be subject to commercial and operational considerations.

3.10.2.3 Support and Other Vessels

Support vessels are used to transport equipment and materials between the MODU/installation vessel and port (e.g. Dampier, Onslow, Exmouth). If required, one of the vessels may be present at the MODU to perform standby duties, and others will make regular trips between the PAA to port for routine, non-routine and emergency operations.

Anchor Handling Vessels (AHVs) may be required to set anchors and support the MODU and the installation vessel, during operations.

A variety of materials are routinely bulk transferred from support vessels to the MODU including drilling fluids (e.g. muds), base fluids, cements, and drill water. Cement, barite and bentonite are transported as dry bulk to the MODU by support vessels and pneumatically blown to the MODU storage tanks using compressed air. A range of dedicated bulk transfer stations and equipment are in place to accommodate the bulk transfer of each type of material. There is also a capacity to bulk transfer waste oil from the MODU to the support vessel, for back loading and disposal on shore.

The loading and back-loading of equipment, materials and wastes is one of the most common supporting activities conducted during drilling programs. Loading and back-loading is undertaken using cranes on the MODU to lift materials in appropriate offshore rated containers (e.g. ISO tanks, skip bins, containers) between the MODU and support vessel.

For power generation, vessels may use diesel-powered generators and/or LNG. All vessels will display navigational lighting and external lighting, as required for safe operations. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant

legislation, specifically the Navigation Act 2012. The MODU and support vessels will be lit to maintain operational safety on a 24-hour basis.

Standby duties may include but are not limited to periods of helicopter operations and working over the side activities while in the field.

Seawater is pumped on board and used as a heat exchange medium for the cooling of machinery engines and high temperature drilling fluid on the MODU. It is subsequently discharged from the MODU at the sea surface at potentially a higher temperature. Alternately, MODUs may use closed loop cooling systems.

Potable water, primarily for accommodation and associated domestic areas, may be generated on vessels using a reverse osmosis (RO) plant. This process will produce brine, which is diluted and discharged at the sea surface.

The MODU and support vessels will also discharge deck drainage from open drainage areas, bilge water from closed drainage areas, putrescible waste and treated sewage and grey water. Solid hazardous and non-hazardous wastes generated during the Petroleum Activities Program are disposed of onshore by support vessels, or may be incinerated where permissible.

Support vessels do not anchor within the PAA during the activities due to water depth; therefore, vessels will utilise DP.

The support vessels are also available to assist in implementation of the WA-61-L Scarborough Drilling and Completions Oil Pollution First Strike Plan (FSP), should an environmental incident occur (e.g. spills).

3.10.2.4 Holding Station: Mooring Installation and Anchor Hold Testing/Soil Analysis

Mooring uses a system of chains/wires and anchors, which may be pre-laid before the MODU arrives at the location, to maintain position when drilling. A mooring analysis will be undertaken to determine the appropriate mooring system for the Petroleum Activities Program. The mooring analysis will identify whether the mooring system will be pre-laid or set by the MODU, define proof tension values, and evaluate whether synthetic fibre mooring ropes are required. A pre-laid system can generally withstand higher sea states compared to a system that only uses the MODUs mooring chain/equipment and can also save the time in establishing anchors.

Installation and proof tensioning of anchors involves some disturbance to the seabed. Anchor handling vessels (AHV) are used in the deployment and recovery of the mooring system.

As part of mooring preparations, anchor hold testing may be conducted at the development well locations. Anchor hold testing would be undertaken if Woodside determines that further assurance is required to ensure a robust mooring design.

Anchor hold testing may consist of an AHV or similar vessel dropping an anchor at a potential mooring location. The AHV would then tension the anchor to determine its ability to hold, embed and not drag at location. This may have to be repeated several times at each location. A ROV may also be utilised to judge how deep the anchor has embedded and independently verify the seabed condition. Anchor hold testing activities would occur prior to the MODU arriving on location.

Soil analysis may also be necessary to provide data on composition and rock/substrate strength as input into the mooring design and verify seabed conditions for anchor holding. Soil analysis could include taking a physical sample of the seabed using ROV or other tools or using measuring devices such as a cone penetrometer. These tests would be carried out up to several months prior to MODU arriving on location and may occur from a support vessel or anchor handling vessel.

Suction piling may be required as a contingent activity and will be reviewed with the MODU contractor.

3.10.2.5 Holding Station: Dynamic Positioning (DP MODU and DP Vessels Only)

DP uses satellite navigation and radio transponders in conjunction with thrusters to maintain the position of the MODU or vessel at the required location. Information relating to the position of the MODU or vessel is provided via seabed transponders, which emit signals that are detected by receivers on the MODU or vessel and used to calculate position. The transponders are typically deployed in a pentagon array on the seabed, using steel clump weights, for the duration of the drilling at each development well. They are recovered at the end, generally by remotely operated vehicle (ROV). Clump weights are recovered if practicable to do so or may be left in situ.

3.10.2.6 Refuelling

The MODU will be refuelled via support vessels approximately once a month or as required. Refuelling will take place within the PAA of the well being drilled at the time and has been included in the risk assessment for this EP. Other fuel transfers that may occur on board the MODU may include refuelling of cranes, helicopters or other equipment as required.

3.10.3 Helicopter Operations

During the Petroleum Activities Program, crew changes will be undertaken using helicopters as required. Helicopters are the primary means of transporting passengers and/or urgent freight to/from the activity. They are also the preferred means of evacuating personnel in an emergency.

Helicopter operations within the PAA are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck.

3.10.4 ROV Operations

The MODU, installation vessel and support vessels may be equipped with a ROV system that is maintained and operated by a specialised contractor aboard the vessel. ROVs may be used during drilling operations and subsea installation, for activities such as:

- anchor holding testing
- pre-drill seabed and hazard survey
- transponder deployment
- blowout preventer (BOP) land-out and recovery
- BOP well control contingency
- visual observations at seabed during riserless drilling operation
- pre and post installation survey
- installation and testing of subsea infrastructure
- xmas tree operations.

An ROV can be fitted with various tools and camera systems that can be used to capture permanent records (both still images and video) of the operations and immediate surrounding environment. Specifically, during installation, the ROV will be fitted with hydraulically driven tools to facilitate flowline tie-in.

An ROV may also be used in the event of an incident for the deployment of the Subsea First Response Toolkit. This is discussed further in **Appendix D**.

3.11 Contingent Activities

The next sections present contingencies that may be required, if operational or technical issues occur during the Petroleum Activities Program. These contingencies have been considered within the relevant impact assessment sections and do not represent significant additional risks or impacts but may generate additional volumes of drilling fluids and cuttings being operationally discharged.

3.11.1 Contingency Development Wells

Two additional development wells may be installed under this EP. The wells would be installed as described in **Section 3.7** (Drilling Activities) and have not yet been located within WA-61-L.

3.11.2 Respud

A respud may be required for a number of reasons, such as if the conductor or well head slumps or fails installation criteria (typically during top hole drilling). Respudding involves moving the MODU to a suitably close location (e.g. about 25m - 50 m from the original location) to recommence drilling. A respud activity would result in repeating top-hole drilling (**Section 3.7.1.2**).

The environmental aspects of respudding are the same as those for drilling and are considered to be adequately addressed by this EP, with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (**Table 6-7**) and discharged at the seabed, from the repeat drilling of the top-hole section, plus an increase in the quantity of cement discharged at seabed from cementing the conductor and surface casing strings.

3.11.3 Workover

The proposed development wells may be worked over to monitor and maintain well integrity as required. A workover may be completed using either a MODU or LWI vessel. The environmental aspects of a workover operation are the same as those for undertaking well completion activities and are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely.

3.11.4 Wireline Logging

Wireline contingencies that may be in place for development drilling include but are not limited to, Gamma Ray (GR) and Casing Collar Locator (CCL) for depth correlation, Ultrasonic Imaging Tool (USIT) and CBL to measure cement integrity, formation pressures (XPT), Density, Neutron and Resistivity and punch perforators/tubing cutters suitable for all tubing sizes. Wireline contingency work will be carried out with appropriate isolation barriers in place, i.e. an overbalanced fluid column. If wireline work is required to take place in a live well, or where there is a risk of barrier failure, then the operation will be carried out with full pressure control equipment at the surface.

Some logging tools may contain low activity radiation sources. Radiation fields are not generally detectable outside the tool when the tool is not energised, therefore they do not present an environmental risk.

3.11.5 Sidetrack

A sidetrack may be required instead of a respud if operational issues are encountered. The environmental aspects of a sidetrack well are the same as those for routine drilling activities, which are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (**Table 6-7**), potential increase in the use of drilling fluids, and the additional emissions (atmospheric and waste) associated with an extended drilling program.

3.11.6 Well Intervention

An intervention may be carried out on any of the Petroleum Activities Program wells. Interventions may be carried out due to down-hole equipment failure or to address underperformance of a well.

Well intervention generally occurs within the wellbore and includes activities such as:

- slickline/wireline/coil-tubing operations
- well testing and flowback
- well workovers (mechanical or hydraulic).

Potential environmental impacts from intervention activities have been included in this EP, including discharge of suspension fluids and brines and small volume gas releases subsea due to removal of a tree cap which may be in place if the well was previously suspended.

During intervention activities, local control of the xmas tree may be required. Valve actuation of the trees may be required, which will result in small releases of subsea control fluids to be released to the environment. Intervention activities also include removing marine fouling by mechanical or acid soaking, resulting in the release of marine-fouling debris and small amounts of acid to the environment (refer to **Table 3-7**). When retrieving intervention tooling, small volumes of wellbore fluids may be displaced back into the well.

3.11.7 Well Abandonment

The Petroleum Activities Program covers the drilling of development wells, which are not envisaged to be abandoned until the end of the production field life. For technical reasons, it may be required to abandon the lower section of a well, prior to sidetracking, or in the event that a respud is required.

Well abandonment activities are conducted in accordance with Woodside's internal standards. Base oil may be used for inflow testing prior to abandonment, to verify barrier integrity (base oil is also used for well cleanup/well test activities and as such has been risk assessed in this EP). Base oil would be pumped down the drill string and reverse circulated back to the rig, with fluids collected for disposal onshore. If stored in a mud pit, the base oil and other fluids associated with the test may result in pit wash water contaminated with hydrocarbons. If this is the case, mud pit wash water would be discharged in accordance with requirements in this EP; with a hydrocarbon content <1% by volume.

If required, wells will be abandoned with abandonment cement plugs, including verification of the uppermost cement plug by tagging and/or pressure testing through a prescribed program. A lower section of a well may also be abandoned prior to sidetracking.

Following abandonment activity, the marine riser and BOP will be removed and every reasonable attempt for retrieval of the wellhead will be made. Wellheads are typically removed by deploying a cutting device on drill pipe which then cuts through the conductor, allowing the wellhead to be retrieved to the surface. Another technique may use an ROV to activate the cutter. The conductor cutting equipment is usually reliable with a high success rate of cutting wellheads. Typically wellhead removal is successful after two attempts therefore this is considered reasonable. If these recognised removal techniques are ineffective after two attempts or technically the cut is deemed unfeasible after the first attempt (e.g. wellhead rotating, cutting BHA misalignment), the wellhead may be left in-situ (refer to **Section 3.11.8**).

3.11.8 Wellhead Assembly Left In-situ

If a well is abandoned due to the requirement to respud, the wellhead assembly may be left in-situ if recognised removal techniques are ineffective. Well abandonment activities would be undertaken as outlined in **Section 3.11.7**, but the wellhead assembly would remain. The integrity of the wellbore is not affected by the wellhead assembly remaining in-situ. The environmental aspects of the wellhead

assembly remaining in-situ are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely.

Final decommissioning of the development wellhead assembly and other subsea infrastructure at the end of field life will be subject to a separate EP.

3.11.9 Sediment Mobilisation and Relocation

If required, an ROV-mounted suction pump/dredging unit may be used to relocate sediment/cuttings around the wellhead or other infrastructure, to keep the area clear and safe for operations and equipment. This activity has the potential to generate plumes of suspended sediment during pumping and disturb benthic fauna in the immediate area.

3.11.10 Venting

During drilling of the well, a kick may occur. A kick is an undesirable influx of formation fluid into the wellbore. To maintain well integrity in this situation, a small volume of greenhouse gases is released to the atmosphere via the degasser, in a well control operation known as ‘venting’.

3.11.11 Emergency Disconnect Sequence

An Emergency Disconnect Sequence (EDS) may be implemented if the MODU is required to rapidly disengage from the well. The EDS closes the BOP (i.e. shutting in the well) and disconnects the riser to break the conduit between the wellhead/BOP and MODU. Common examples of when this system may be initiated include the movement of the MODU outside of its operating circle (e.g. due to a failure of one or more of the moorings or dynamic positioning system) or the movement of the MODU to avoid a vessel collision (e.g. third-party vessel on collision course with the MODU). EDS aims to leave the wellhead and BOP in a secure condition but will result in the loss of the drilling fluids/cuttings in the riser following disconnection.