WESTERN GAS

WA-474-P, WA-70-R SUSPENDED WELLS

ENVIRONMENT PLAN SUMMARY

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ACRONYMS

Abbreviation	Description
"	Inch
µ	Micron
µm	Micrometre
AFMA	Australian Fisheries Management Authority
AHD	Australian Heritage Database
AHS	Australian Hydrographic Service
AIMS	Australian Institute of Marine Science
AIS	Automatic identification system
ALARP	As low as reasonably practicable
AMBA	Area that may be affected
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
EPA	Environmental Protection Authority (WA)
APPEA	Australian Petroleum Production and Exploration Association
API	American Petroleum Institute
AQIS	Australian Quarantine and Inspection Service
AS/NZS	Australian Standard/ New Zealand Standard
bbl	Barrel (units of oil)
dB	Decibel
CFA	Commonwealth Fisheries Association
CHARM	Chemical Hazard and Risk Management
CIN	CHARM Implementation Network
cm	Centimetre
CMP	Commonwealth Marine Park
CO_2	Carbon dioxide
DPDEWHA	Department of the Environment, Water, Heritage and the Arts
DMP	Department of Mines and Petroleum (WA)
DNV	Det Norske Veritas
DoEE	Department of the Environment and Energy (formerly the Department of Environment)
DoF	Department of Fisheries (Western Australia)

Abbreviation	Description
DoT	Department of Transport (Western Australia)
DP	Dynamic positioning
DPIRD - Fisheries	Department of Primary Industries and Regional Development – Fisheries (Western Australia) (Previously Department of Fisheries).
EHS	Environment, Health and Safety
ENVID	Environmental impact identification
EP	Environment Plan, prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ft	Foot is a unit of length in imperial units
g/m^2	Grams per square metre
KEF	Key ecological feature
kg	Kilogram
hr	Hour
HSES	Health, Safety & Environment Specialist
Hz	Hertz
IAP	Incident Action Plan
IAPP	International Air Pollution Prevention
IBC	Intermediate bulk container
ICS	Incident command system
IMO	International Maritime Organisation
IMS	Invasive marine species
IMT	Incident Management Team
IOPP	International Oil Pollution Prevention (Certificate)
ISPP	International Sewage Prevention Pollution
IUCN	International Union for Conservation of Nature
kHz	Kilohertz
km	Kilometre
L	Litre
LC_{50}	The concentration of a substance that is lethal to 50% of the population exposed to it for a specified time
LoR	Limit of reporting

Abbreviation	Description
m	Metre
m^2	Square metre
m^3/day	Cubic metres per day
mg/L	Milligrams per litre
m/s and m s^{-1}	Metres per second
MC	Monitoring Coordinator
MDO	Marine diesel oil
mm	Millimetre
MOU	Memorandum of Understanding
MP	Monitoring Personnel
MS	Method statement
MSA	Master service agreement
NRC	National Research Council
NEBA	Net environmental benefit analysis
NEC	No effect concentration
nm	Nautical mile is a unit of distance equal to 1,852 metres
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NWS	North west shelf
OCNS	Offshore Chemical Notification Scheme
ODS	Ozone-depleting substances
OPEP	Oil pollution emergency plan
OPG	International Association of Oil and Gas Producers
OPGGS	Offshore Petroleum and Greenhouse Gas Storage
OSMP	Operational and Scientific Monitoring Plan
OSRD	Oil spill risk database
pa	Pascal (unit of pressure)
PMS	Preventative maintenance system
ppb	Parts per billion
PPE	Personal protection equipment
ppm	Parts per million
ROV	Remotely operated vehicle
RCC	Rescue Coordination Centre
SDS	Safety data sheet
SEL	Sound exposure level

Abbreviation	Description
sm^3	Standard cubic metre
SMIP	Scientific Monitoring Implementation Plan
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	Safety Of Life At Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
TL	Technical Lead
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WDCS	Whale and Dolphin Conservation Society
WOMP	Well Operations Management Plan

1 INTRODUCTION

1.1 PROJECT OVERVIEW

In November 2017, Australian owned Western Gas Corporation Pty Ltd (Western Gas) acquired the entities holding WA-474-P and WA-70-R titles from US oil, gas and energy company, Hess Corporation.

Western Gas propose to retain five (5) exploration wells in suspension and to conduct well head inspection activities (hereafter referred to as 'the Activity') on the one (1) suspended gas / gas condensate well within Permit Area WA-474-P and four (4) suspended wells within adjacent Permit Area WA-70-R, located in the Northern Carnarvon Basin in Commonwealth waters. The Permit Areas are located approximately 145 km (78 nm) north of the North West Cape (Exmouth area) and about 275 km (148 nm) west of Dampier.

The wells were suspended as part of previous exploration drilling programs in the Permit Areas. All well suspension activities, including surveillance requirements, are being undertaken in accordance with a National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) accepted Well Operations Management Plan (WOMP) (EP-AU-SUF-RPT-01045 Rev 1). The surveillance involves one non-intrusive visual inspection of the well heads, accomplished via remotely operated vehicle (ROV) videography acquired during a single survey of all five suspended wells within the lifetime of the WOMP.

This revision to the previously accepted WA-474 Exploration Drilling Environment Plan (EP) is to address the well suspension activities and the change of entity names of the titleholders for the WA-474-P and WA-70-R titles.

1.2 TITLEHOLDER AND LIAISON PERSON DETAILS

1.2.1 Titleholder

Permit Area WA-474-P:

Name: Western Gas (474 P) Pty Ltd

Business address: 4/189 Stirling Hwy, Nedlands WA 6009

Telephone no: +61 8 6468 0667

Email: info@westerngas.com.au

ACN: 126 805 963

Permit Area WA-70-R:

Name: Western Gas (70 R) Pty Ltd

Business address: 4/189 Stirling Hwy, Nedlands WA 6009

Telephone no: +61 8 6468 0667

Email: info@westerngas.com.au

ACN: 122 238 699

1.2.2 Nominated Liaison Person

Name: Richard Baker

Business address: 4/189 Stirling Hwy, Nedlands WA 6009

Telephone no: +61 8 6468 0667

Email: info@westerngas.com.au

2 DESCRIPTION OF THE ACTIVITY

2.1 OVERVIEW

One (1) exploration well will remain suspended within Petroleum Permit Area WA-474-P and four (4) exploration wells will remain suspended within Permit Area WA-70-R. The Permit Areas are in Commonwealth waters (Figure 2-1). Temporary plugging and abandonment (suspension) of these wells has already occurred, as described in the accepted WOMP. The WOMP requires periodic (five yearly) well head inspections.

The well head inspection survey is anticipated to take approximately 72 hours to complete, with active ROV operations expected to take approximately 6 hours at each well site. The survey will be conducted on a five-yearly basis, with the first survey currently scheduled to occur between Q4 2020 and Q1 2022. Since the actual timing of the survey is dependent on vessel availability and weather conditions, this EP has accounted for activities occurring in all seasons.

During the survey, the Operational Area is defined as a 500 m zone surrounding the well location.

The survey will be undertaken using a single vessel that has been operating in Western Australia, mobilising from either Exmouth or Karratha/Dampier.

A summary of the Activity is provided below in Table 2-1.

Table 2-1: Activity summary

Items	Data
Well Type	Suspended
Number of wells	5 wells
Water depth range	900–1,200 m
Vessel type	Subsea Support Vessel or similar
Active ROV time to inspect each well[1]	~ 6 hours
Estimated total survey duration	~ 72 hours
Number of vessels	1

[1] Including contingency time for weather delays.

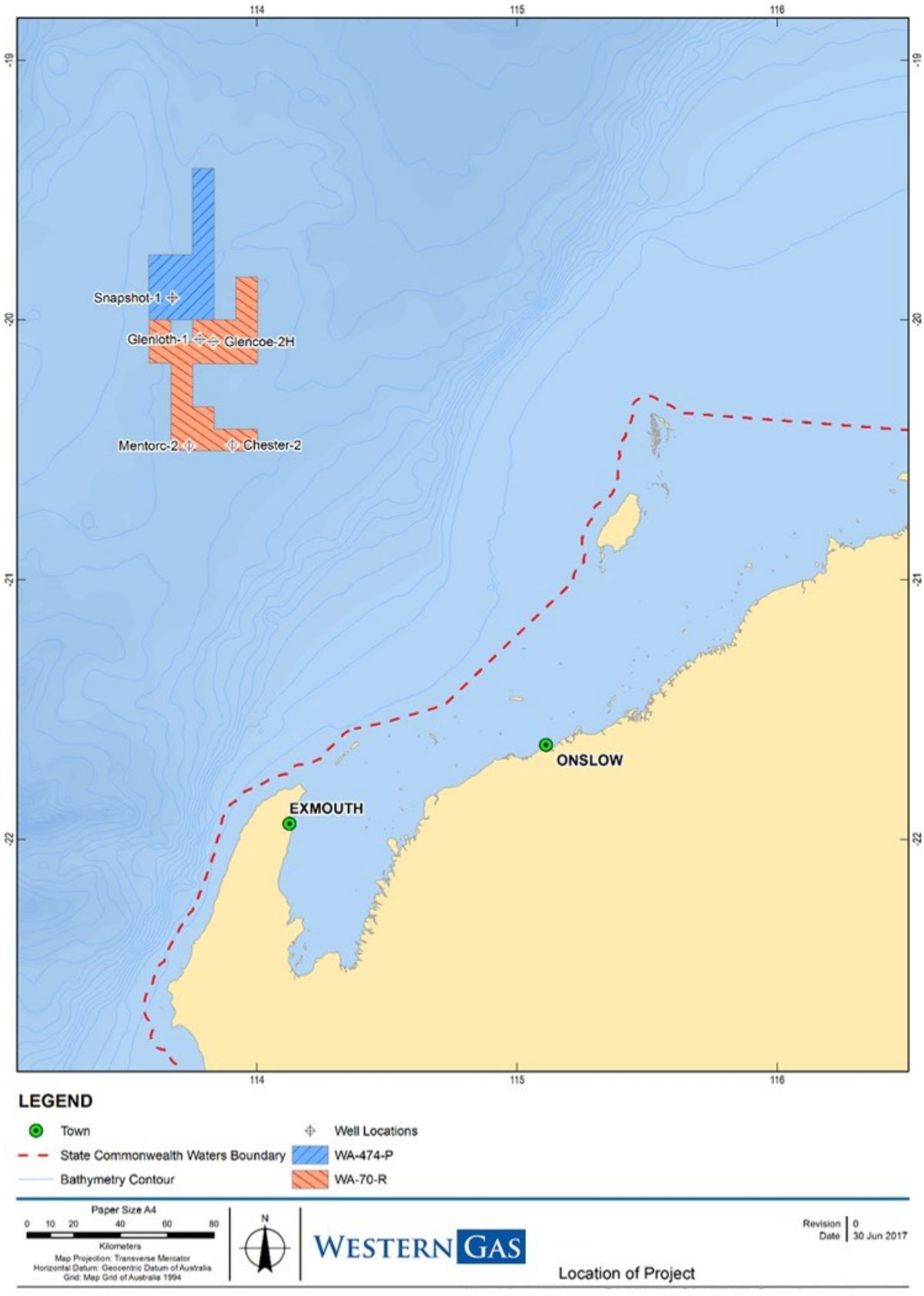

Figure 2-1: Location of Activity - Permit Areas WA-474-P and WA-70-R

2.2 MARINE OPERATIONS

During the Activity, a vessel will be used to transport and provide a platform for the ROV inspection of each well head.

Refuelling of the vessel will only occur in an established port facility in accordance with established guidelines. At this stage, the specific survey vessel has not been identified. The vessel will only form a part of the Petroleum Activity when working at the well sites supporting ROV operations. Transit to and from the Operational Area and standby activities between well head inspection operations do not form part of the Petroleum Activity.

As part of the Activity, a ROV will be used for the monitoring of well heads. ROVs can be fitted with various tools and are fitted with camera systems (still/video), which can be used to capture permanent records of the environment and operations. If necessary to allow inspection, the ROV will be used to clear marine growth from the well head.

2.2.1 Well Completion

After the target depths were reached, and the wells had been evaluated, the wells were suspended. The wellhead system (including suspension cap) remains above the mudline and a mud-mat (attached to the 0.9 m [36”] conductor) is in place on the seabed measuring approximately 3 m x 3 m (10ft x 10 ft). Verified barriers are in place to ensure well integrity as per the NOPSEMA-accepted Well Operation Management Plan (WOMP).

Since the integrity of the wells is assured, no further well completion will be required as part of the Activity. No barriers identified as part of the WOMP will be modified during the Activity.

3 EXISTING ENVIRONMENT DESCRIPTION

3.1 AMBA FROM THE OPERATION OF THE ACTIVITY (PLANNED EVENTS)

To establish an operational (planned) Area that May Be Affected (AMBA), the areas of potential impact were investigated for each of the planned events. The two planned events of noise emissions (Section 5.5) and routine liquid discharges (Section 5.7) will cause the largest area of influence, which will be confined to within 3 km (1.6 nm). However, as the Activity involves wells across two permit areas, the full extent of the permit areas has been considered to describe the environment.

The AMBA for the following planned events (i.e. impacts) is set by a 3 km (1.6 nm) boundary around the Operational Area:

- Physical presence (Section 5.3);
- Seabed disturbance (Section 5.4);
- Noise emissions (Section 5.5);
- Atmospheric emissions (Section 5.6);
- Routine liquid discharges (Section 5.7); and
- Solid waste (Section 5.8).

3.2 AMBA DUE TO UNPLANNED EVENTS

For the following unplanned events (i.e. risks), the AMBA is set by a 3 km (1.6 nm) boundary around the well site (Figure 3-1):

- Spills of environmentally hazardous chemicals or refined oil (Section 6.2);
- Interference with marine fauna (Section 6.3); and
- Dropped objects (Section 6.4).

The hazard with the worst-case potential environmental impact and largest AMBA was identified as a fuel tank rupture (Section 6.1).

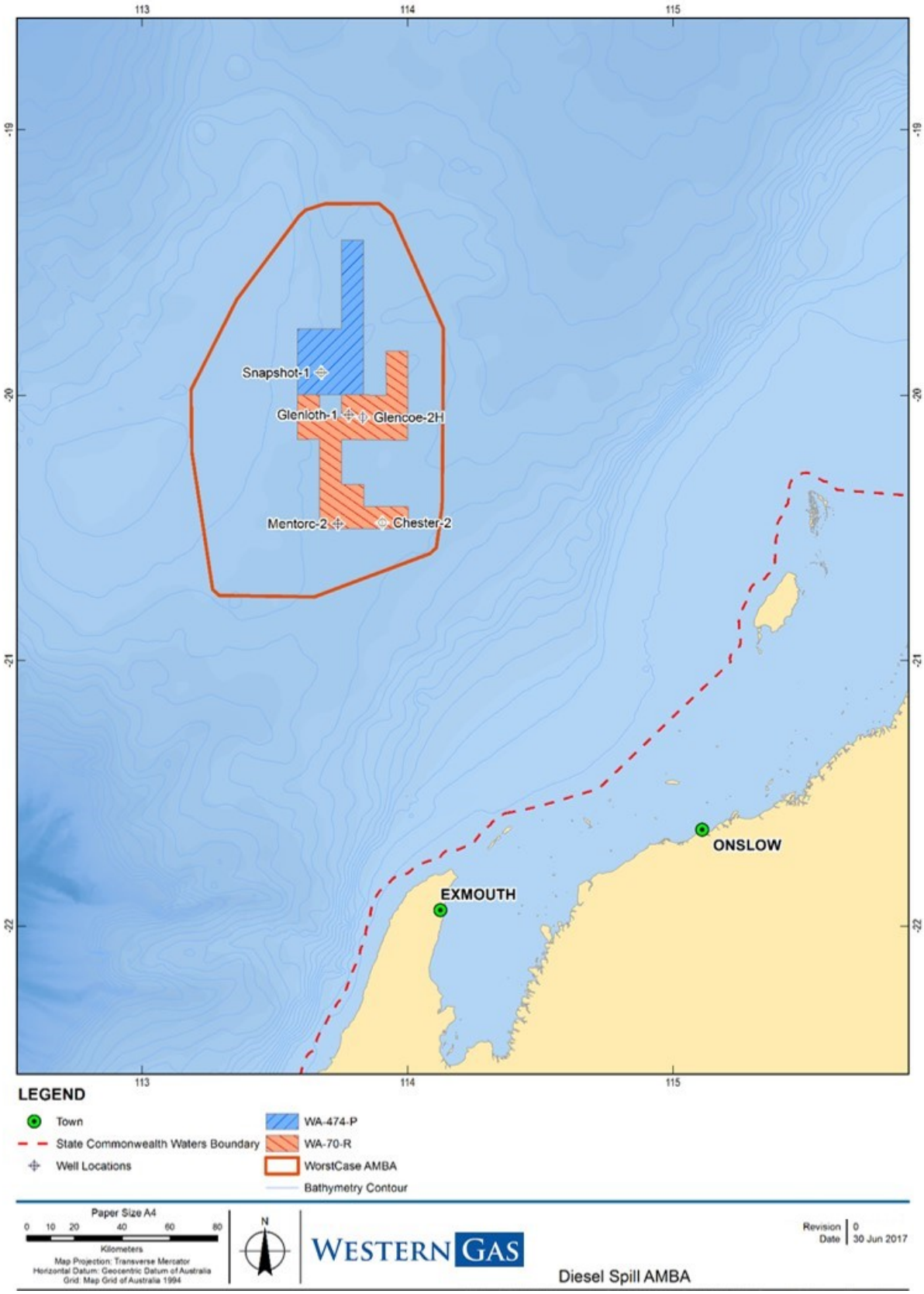

Figure 3-1: AMBA for a 100 m^3 diesel spill

3.3 REGIONAL GEOGRAPHICAL SETTING

Permit Areas WA-474-P and WA-70-R are in a deep-water region north of the Exmouth coastline, adjacent to the Exmouth Plateau on the North West Shelf (Figure 2-1). The permit areas are located on the Continental Slope of Commonwealth waters in water depths of 900 to 1,200 m.

The proposed Activity will be undertaken within the Northern Carnarvon Basin. This basin is dominated by a southwest-trending set of troughs, these being the Exmouth, Barrow, Dampier, and Beagle Sub-basins. These are the major Mesozoic depocentres of the southern North West Shelf, containing up to 15 km (9 nm) of Mesozoic sedimentary rock (GeoScience Australia, 2014[2]).

3.4 RELEVANT VALUES AND SENSITIVITIES OF THE ENVIRONMENT

3.4.1 Habitats

Although targeted benthic assessment of the full Operational Area has not been undertaken, previous box coring, pre-drilling ROV surveys, sediment grab sampling and seismic and sonar surveys have been undertaken by Hess Corporation throughout the WA-70-R (then WA-390-P) Permit Area. Given the proximity of WA-70-R and WA-474-P, the similarity of water depths and absence of any hard substrate, it is assumed that WA-70-R and WA-474-P would exhibit similar benthic attributes.

Therefore, the Operational Area and AMBA are likely to be comprised of deep, soft sediments with typical infauna and epifaunal macro-invertebrates of this type of habitat within the North West Province and on a larger scale, the North West Shelf region (Ward and Rainer, 1988[3]). In this region, benthic communities in depths greater than 200 m primarily are comprised of scavengers, detrital feeders and filter feeding organisms (DEWHA, 2007[4]) with percentage cover of epibenthic communities typically less than shallower regions (Fulton et al., 2006[5]). As the Operational Area and AMBA lies in waters deeper than 250 m (820 ft) with a homogenous seafloor, it is unlikely that sensitive benthic habitats will be encountered.

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2 GeoScience Australia (2014) Carnarvon Basin- Basin Details and Geological Overview accessed via http://www.ga.gov.au/scientific-topics/energy/province-sedimentary-basin-geology/petroleum/offshore-northwest-australia/canarvon.

3 Ward, T.J. and Rainer, S.F. (1988). Decapod crustaceans of the North West Shelf, a tropical continental shelf of North-Western Australia. Australian Journal of Marine and Freshwater Research, 39: 751-765.

4 Department of Water, Environment, Heritage and the Arts (DEWHA). (2007). A Characterisation of the Marine Environment of the North-west Marine Region. A summary of an expert workshop convened in Perth, Western Australia, 5-6 September 2007. Prepared by the North-west Marine Bioregional Planning Section, Marine and Biodiversity Division. DEWHA, Canberra, ACT.

5 Fulton, E., Hatfield, B., Althaus, F., and Sainsbury, K. 2006. NWSJEMS Technical Report No. 11- Benthic habitat dynamics and models on Australia's North West Shelf.

3.4.2 Marine Protected Areas

There are no protected areas within the Operational Area and one marine park within the spill AMBA. The spill AMBA intersects the Multi-use zone (IUCN category VI) of the Gascoyne Commonwealth Marine Park. A description of the marine park key features is detailed in Table 3-1.

Table 3-1: Key features of the Gascoyne Commonwealth Marine Park

Commonwealth Marine Parks & Marine Management Areas	Key Features
Gascoyne Commonwealth Marine Park	• Important foraging area for migratory seabirds, turtles and the whale shark. • A continuous connectivity corridor from shallow depths around 15 m out to deep offshore waters on the abyssal plain at over 5,000 m in depth. • Seafloor features including canyon, terrace, ridge, knolls, deep hole/valley and continental rise. It also provides protection for sponge gardens in the south of the reserve adjacent to Western Australian coastal waters. • Ecosystems examples from the Central Western Shelf Transition, the Central Western Transition and the Northwest province provincial bioregions as well as the Ningaloo meso-scale bioregion. • The canyons in this reserve are believed to be associated with the movement of nutrients from deep water over the Cuvier Abyssal Plain onto the slope where mixing with overlying water layers occurs at the canyon heads. These canyon heads, including that of Cloates Canyon, are sites of species aggregation and are thought to play a significant role in maintaining the ecosystems and biodiversity associated with the adjacent Ningaloo Reef. • The reserve therefore provides connectivity between the inshore waters of the existing Ningaloo Commonwealth marine park and the deeper waters of the area.

3.4.3 Key Ecological Features

The Exmouth Plateau Key Ecological Feature (KEF) occurs within the Operational Area and spill AMBA. The Exmouth Plateau is a regionally and nationally unique tropical deep sea plateau. It may serve an important ecological role by acting as a topographic obstacle that modifies the flow of deep waters which generate internal tides, causing upwelling of deeper water nutrients closer to the surface (Brewer *et al*. 2007[6]).

[6] Brewer, D.T., Lyne, V., Skewes, T.D. and Rothlisberg, P. (2007). Trophic Systems of the North West Marine Region. Prepared for the Department of the Environment, Water, Heritage and the Arts by CSIRO Marine and Atmospheric Research, Cleveland, Australia.

3.4.4 Fisheries

The Commonwealth and State managed fisheries that occur within the Operational Area and the spill AMBA are listed in Table 3-2.

Table 3-2: Commonwealth and State fisheries within the operational area and spill AMBA

Value/Sensitivity	AMBA	
	Operational Area	Diesel Spill
Commonwealth Managed Fisheries		
Southern Bluefin Tuna	✓	✓
Western Deepwater Trawl Fishery	✓	✓
Western Tuna and Billfish Fishery	✓	✓
North West Slope Trawl Fishery	✓	✓
State Managed Fisheries (North Coast Bioregion)		
Mackerel Managed Fishery	✓	✓

3.4.5 Tourism

Tourism activities have not been identified to occur within the Operational Area or the larger hydrocarbon spill AMBA due to the water depths and distance offshore.

3.4.6 Oil and Gas Industry

The Operational Area and spill AMBA do not overlie any existing petroleum infrastructure.

3.4.7 Commercial Shipping

A recognised shipping fairway traverses the permit areas.

3.4.8 Cultural Heritage

A search of the Australian Heritage Database (AHD) did not identify any listed heritage sites.

3.4.9 Defence

The permit areas overlap the Learmonth military restricted airspace area. The Defence Department has previously advised that this is not a currently active range.

3.4.10 World Heritage Property

No World Heritage Areas or Properties are located within the Operational Area or spill AMBA.

3.4.11 National Heritage Properties

There are no National Heritage Properties occurring within the Operational Area or spill AMBA.

3.4.12 Ramsar Wetlands

There are no Ramsar wetlands occurring within the Operational Area or spill AMBA.

3.4.13 Listed Threatened Species or Ecological Communities

The listed threatened species that may occur within the Operational Area or spill AMBA were identified from the EPBC Act Protected Matters Reports. The species are listed in Table 3-4. There were no listed threatened ecological communities identified within the Operational Area or spill AMBA.

One Biologically Important Area (BIA), the migratory route for the pygmy blue whale (*Balaenoptera musculus*), overlaps with the Operational Area and spill AMBA.

3.4.14 Environmentally Sensitive Windows

Sensitive time windows for key (including threatened) ecological and socio-economic sensitive receptors within the hydrocarbon spill AMBA that exhibit seasonality are summarised in Table 3-5. Some species have not been included due to lack of conclusive life cycle or migratory information.

Table 3-3: Threatened and migratory species occurring in the Operational Area and spill AMBA

Common Name	Scientific Name	EPBC Listing			Presence	
		Listed Threatened	Listed Migratory	Other matters	Operational Area	Diesel Spill AMBA
Fish and Sharks						
Great white shark	*Carcharodon carcharias*	✓	✓	-	M	M
Shortfin mako	*Isurus oxyrinchus*	-	✓	-	L	L
Longfin mako	*Isurus paucus*	-	✓	-	L	L
Giant manta ray	*Manta birostris*	-	✓	-	M	M
Marine Mammals – Whales						
Sei whale	*Balaenoptera borealis*	✓	✓	✓	L	L
Blue whale	*Balaenoptera musculus*	✓	✓	✓	Mi	Mi
Fin whale	*Balaenoptera physalus*	✓	✓	✓	L	L
Humpback whale	*Megaptera novaeangliae*	✓	✓	✓	M	M
Bryde's whale	*Balaenoptera edeni*	-	✓	✓	M	M
Antarctic minke whale	*Balaenoptera bonaerensis*	-	✓	✓	M	M
Sperm whale	*Physeter macrocephalus*	-	✓	✓	M	M
Killer whale	*Orcinus orca*	-	✓	✓	M	M
9 other species of whale		--	-	✓	M	M
Marine Mammals - Dolphins						
8 dolphin species		-	-	✓	M	M
Marine Reptiles						
Loggerhead turtle	*Caretta caretta*	✓	✓	✓	L	L
Green turtle	*Chelonia mydas*	✓	✓	✓	L	L
Leatherback turtle	*Dermochelys coriacea*	✓	✓	✓	L	L
Flatback turtle	*Natator depressus*	✓	✓	✓	L	L
Hawksbill turtle	*Eretmochelys imbricata*	✓	✓	✓	L	L
7 seasnake species		-	-	✓	M	M
Marine Birds						
Red knot	*Calidris canutus*	✓	✓	✓	M	M
Southern giant-petrel	*Macronectes giganteus*	✓	✓	✓	M	M
Common noddy	*Anous stodidus*		✓		M	M
Lesser frigatebird	*Fregata ariel*		✓		M	M

Note: '**M**': Species or species habitat may occur within area. '**F**': Foraging, feeding or related behaviour likely to occur within area. '**L**': Species or species habitat likely to occur within area. '**BK**': Breeding known to occur within area. '**BL**': Breeding likely to occur within area. '**K**': Species or species habitat known to occur within area '**C**': Congregation or aggregation known to occur within the area. Note: '**Mi**': Migration route known to occur within area.

Table 3-4: Summary of activity windows for ecological and socio-economic sensitivities

Receptor	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ecological												
Humpback whale							From S to N		From N to S			
Blue whale			From S to N							From N to S		
Sharks and rays												
Seasnakes												
Loggerhead turtle [1]												Nesting
Leatherback turtle [2]												
Green turtle [1]												Nesting
Flatback turtle [1]												Nesting
Seabirds												
Fish spawning												
Socio-economic												
Commercial Fisheries (Commonwealth)	- Southern Bluefin Tuna - North West Slope Trawl Fishery						- Western Deepwater Trawl Fishery - Western Tuna and Billfish Fishery					
Commercial Fisheries (State)	- Mackerel managed fishery											
Oil and gas activity												
Shipping activity												
Tourism/ recreational fishing												

Colour code

Colour	Activity
	Peak activity, presence reliable and predictable
	Lower level of abundance/activity/presence
	Activity/sensitivity can occur throughout the year
	Activity/sensitivity not occurring
1	Turtle hatchlings emerge ~ 60 days after nesting
2	No breeding/nesting activity recorded in WA

4 IMPACT AND RISK ASSESSMENT APPROACH

4.1 RISK ASSESSMENT AND MANAGEMENT SYSTEM FRAMEWORK

Western Gas has an established strategy to manage risks that may impact health, safety and the environment. The Western Gas EHSMS framework provides a risk-based methodology to manage EHS through their operations and activities. This involves:

- Identification of EHS hazards and aspects;
- Assessment and ranking risks associated with operations and activities;
- Selection, implementation and maintenance of a structured system of controls; and
- Monitoring the effectiveness of the process and identifying areas for improvement.

4.2 ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

An environmental risk assessment (ENVID) was undertaken for all the planned and unplanned events covered by the EP. The impacts and risks assessment methodologies employed are consistent with the approach outlined in the following standards:

- Australian Standard/New Zealand Standard (AS/NZS) ISO 31000:2009 Risk Management – Principles and Guidelines (Standards Australia / Standards New Zealand 2009).
- AS/NZS Handbook 203:2012 Environmental Risk Management – Principles and Process (Standards Australia / Standards New Zealand 2012).

4.2.1 Terminology

Throughout the impact and risk assessment process, the following terminology is used in accordance with the OPGGS (Environment) Regulations and standard industry practice (Table 4-1).

Table 4-1: Risk management and environmental performance terminology

Terminology	Definition
Acceptability	Determined from a demonstration of the ALARP principle, consistency with internal context (e.g. corporate requirements), applicable state, national and international legislations; other requirements (national, international standards and best practice); and external context (e.g. consideration of relevant stakeholder consultation when determining control measures).
ALARP	As Low as Reasonably Practicable The ALARP principle is that the residual impacts and risks shall be 'as low as reasonably practicable'.
Severity (Consequence)	The severity of the impact being realised (i.e. an impact in terms of adverse effects on the people, environment, assets or reputation).
Control Measure	A system, an item of equipment, a person or a procedure, that is used as a basis for managing environmental impacts and risks.
Environmental Impact	Any change to the environment, whether adverse or beneficial, that wholly or partially results from an activity.
Environmental Performance Outcome	An outcome that demonstrates that the environmental performance will meet or better the acceptable level of impacts and risks of the activity.
Environmental Performance Standard	A statement of the performance required of a control measure.
Environmental Measurement Criteria	Verification to demonstrate that the Environmental Performance Outcome and Environmental Performance Standard are being met.
Environmental Risk	A function of the likelihood of an event occurring and the consequence of the environmental impact.
Hazard	A situation with the potential for causing harm to people, assets, the environment or reputation.
Planned Event	An activity that is intended to occur.
Likelihood	The probability or frequency of an event occurring.
Unplanned Event	An event that is not intended to occur despite control measures in place.

4.2.2 Environmental Risk Assessment Methodology (Unplanned Events)

This risk assessment methodology used for unplanned events that may result from the proposed Activity is illustrated schematically in Figure 4-1.

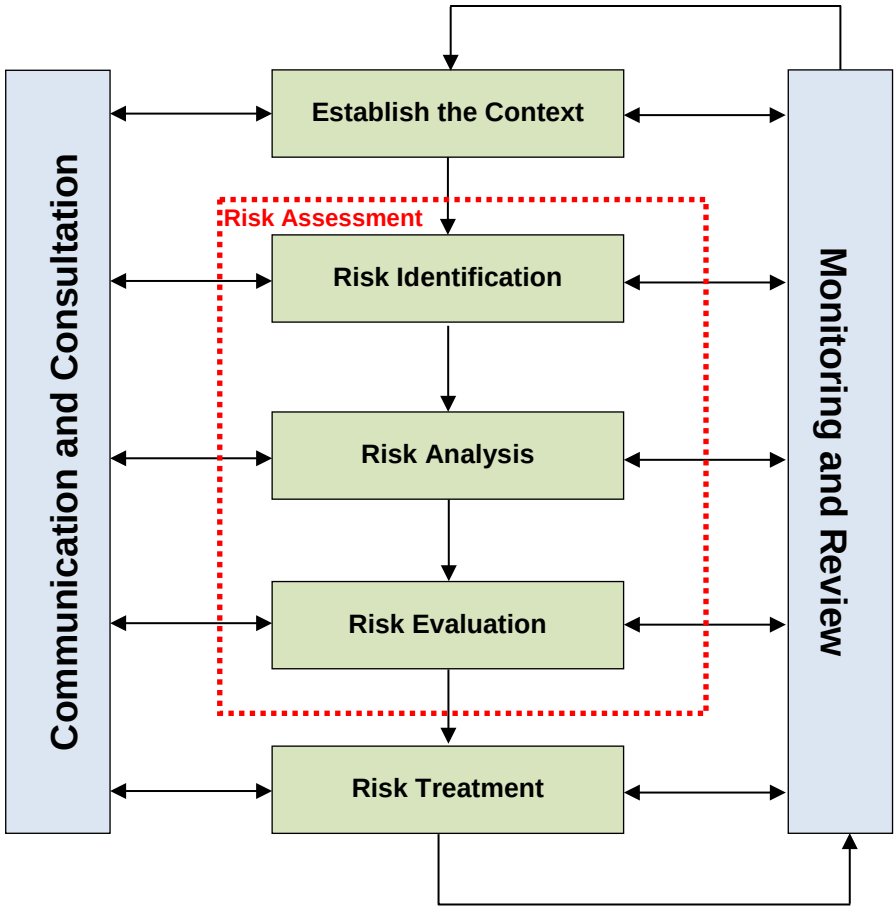

Figure 4-1: Schematic of risk assessment methodology[7]

The main components of the risk assessment methodology include:

- Identify the activities and the events associated with them that could cause a potential impact to the values (attributes) at risk within and adjacent to the operational area.
- Determine the likelihood and severity (i.e. consequence) of the events with standard control measures. Where practicable, quantification of the magnitude of the stressor, the concentration of the contaminant and/or level of disturbance was made. Further, timing, duration and other factors affecting the impact and risk were considered.

[7] Modified from AZ/NZS ISO 31000:2009 Risk Management.

- The environmental risk rating of an unplanned event is determined from the combination of the likelihood and the expected severity (i.e. consequence). Risks are rated with the Western Gas EHS Qualitative Risk Matrix (Figure 4-2) with a 'severity' ranking of 1 (slight) to 5 (catastrophic) and a 'likelihood' ranking of A (rare) to E (almost certain).

The likelihood of an event's occurrence is assessed 'with' standard industry controls in place; however, the severity (i.e. consequence) is assessed 'without' them.

The risk ratings are aligned with Western Gas' risk tolerance and associated response guidance to manage or to reduce (as necessary) the risks as described in Table 4-2. Review of the standard industry control measures for each of the risks and proposing additional control measures is then considered, as required.

The severity of impacts from several unplanned (i.e. accident/incident) hydrocarbon release events to the marine environment are not acceptable, but the risk of these occurring has been assessed on the basis of Western Gas' risk rating and acceptability criteria (refer to Section 4.2.5).

Additionally, control measures to mitigate the impacts of these unplanned events are also risk assessed (e.g. spill response activities).

4.2.3 Environmental Impact Assessment Methodology (Planned Events)

The impact assessment methodology for planned events is based on the risk assessment methodology outlined in Section 4.2.2. However, for planned events, environmental impacts are assessed solely on the severity (i.e. consequence) component of the risk matrix as per the descriptors in Table 4-3. Corresponding Western Gas acceptability criteria and response guidance for severity levels are also described in Table 4-3.

	A	B	C	D	E	
	Likelihood					
5 Catastrophic	Medium 5	Medium 10	High 15	High 20	High 25	Severity
4 Major	Medium 4	Medium 8	Medium 12	High 16	High 20	
3 Severe	Low 3	Medium 6	Medium 9	Medium 12	High 15	
2 Minor	Low 2	Low 4	Medium 6	Medium 8	Medium 10	
1 Slight	Low 1	Low 2	Low 3	Medium 4	Medium 5	
	Rare 1	Unlikely 2	Possible 3	Probable 4	Almost Certain 5	

A	B	C	D	E
The event may only occur in exceptional circumstances	The event could occur at some time	The event may occur at some time	The event will probably occur in most cuircumstances	The event is expected to occur in most circumstances
Rare	Unlikely	Possible	Probable	Almost Certain
Likelihood				

Figure 4-2: Western Gas EHS qualitative risk matrix

Table 4-2: Western Gas risk rating and risk tolerance

Risk Rating		Risk Tolerance	Definition and Response
	High	Intolerable (Unacceptable)	If the risk level is High, it is considered to be unacceptable. If a high risk result remains, once all available controls have been identified, the task must not be undertaken. Further review, consultation and risk assessment is required.
	Medium	Tolerable (Acceptable)	A risk defined as Medium is considered tolerable. Although risk is tolerable, efforts should still be made to reduce them to levels that are as low as reasonably practicable (ALARP).
	Low	Acceptable	A risk defined as Low is considered acceptable. If a risk is acceptable, this does not necessarily preclude the initiation of improvements if they are economic, readily identified and practicable.

Table 4-3: Western Gas severity categories and descriptors

Severity/ Consequence Level	Environment Severity Descriptor	Impact Acceptability (only applicable for planned events)	Notes on Impact
Catastrophic	Massive effect; environmental impact could last for decades; long term contamination requiring remediation.	Unacceptable	Not meeting legal, community or stakeholder requirements and expectations or Western Gas' standards. Impact not acceptable based on severity and the planned event leading to the impact.
Major	Major effect; environmental impact could last for years; area becomes restricted for a limited period of time.	Unacceptable	Not meeting legal, community or stakeholder requirements and expectations or Western Gas' standards. Impact not acceptable based on severity and the planned event leading to the impact.
Severe	Severe effect; environmental impact could last for months; reportable quantity spill or release; spill or release requires clean-up.	Unacceptable	Impact not acceptable and the planned activity leading to the impact cannot progress without additional long term impact reduction measures. Increased resources and management focus required to ensure impact reduced to ALARP and an acceptable level.
Minor	Minor effect; environmental impact could last for weeks; spill or release external to facility; no clean-up required.	Acceptable with impacts managed via the Company's Management Systems and ALARP demonstrated.	Impact is acceptable if reasonable safeguards/management systems are confirmed to be in place, where it has been demonstrated as being ALARP and of an acceptable level.

Severity/ Consequence Level	Environment Severity Descriptor	Impact Acceptability (only applicable for planned events)	Notes on Impact
Slight	Slight effect; environmental impact could last for days; no long-term consequences; spill or release internal to facility.	Acceptable, with impacts managed via the Company's Management Systems and ALARP demonstrated.	Impact is generally regarded as acceptable by a broad range of stakeholders. Adequate resources and management focus to ensure impact are ALARP and of an acceptable level.

4.2.4 ALARP Demonstration

Regulation 10A(a) of the OPGGS (Environment) Regulations requires that the Environment Plan must demonstrate that the environmental impacts and risks of the activity will be reduced to ALARP.

For an activity to be considered ALARP, the Environment Plan must demonstrate, through reasoned and supported arguments, that there are no other practicable control measures that could reasonably be implemented to reduce the environmental impacts and risks of the Activity. The key principles underpinning the ALARP principle include:

- Reasonable practicability - There are no reasonably practicable alternatives to the activity.
- There are no additional reasonably practicable measures available to further reduce the risk or impact.
- The sacrifice (cost, time, effort) for implementing further control measures is grossly disproportionate to the reduction in risk or impact and the environmental benefit gained.

Control measures should be implemented that are not grossly disproportionate in 'cost' to the reduction in environmental risk or impacts, or benefit gained by the environment. Such 'costs' can be health risks, safety risks, alternative environmental impacts/risks, financial cost and/or schedule related costs. The 'costs' can also be associated with the technical feasibility, reliability and operability of an activity or a control measure.

The hierarchy of control is a key principle underpinning the ALARP principle[8]. The hierarchy of controls for environmental hazards typically includes:

- Eliminate – Remove the risk; eliminate the hazard.
- Substitute – Replace risk with a less hazardous one.
- Engineering – Introduction of engineering controls to prevent the source of risk.

[8] NOPSEMA (2012). Control Measures and Performance Standards Guidance Note. N040300-GN0271. Revision No. 4. December 2012.

- Administrative – Implementation of procedures, competency and training to minimise the risk.
- Protective – Introduce protective measures and equipment.

If the environmental risk of an unplanned event is 'High' (intolerable) (Table 4-2) or the impact of a planned event is 'Unacceptable' (Table 4-3), then the activity is not ALARP and shall not be carried out.

If the environmental risk of an unplanned event is 'Medium' (tolerable) (Table 4-2) or the impact of a planned event is 'Minor' (Table 4-3), although the risk and impact are tolerable/acceptable, efforts should still be made to identify additional control measures (if any) that are not disproportionate to the benefit gained, to demonstrate the levels are reduced to ALARP.

Similarly, if the environmental risk of an unplanned event is 'Low' (acceptable) (Table 4-2) or the impact of a planned event is 'Slight' (Table 4-3) and the control measures are consistent with good industry practice, then ALARP is demonstrated. However, if a readily available control measure will further reduce the impact or risk and the cost of implementation is not disproportionate to the benefit gained, then it is considered 'reasonably practicable' and is implemented.

The specific application of the ALARP principle to hazards associated with planned and unplanned events has been included in the relevant sections of this Environment Plan.

4.2.5 Acceptability Determination

Regulation 10A(c) of the OPGGS (Environment) Regulations requires that the Environment Plan demonstrates that the environmental impacts and risks of the Activity will be of an acceptable level. In the context of 'Acceptability' several elements need to be considered. In this Environment Plan, the environmental impacts and risks associated with the activity are determined 'Acceptable' if the following criteria are met:

- For planned (routine) events, the residual environmental severity (i.e. consequence) is considered 'Minor Effect' or 'Slight Effect', and has been demonstrated ALARP; or
- For unplanned (i.e. accident/incident) events, the residual environment risk is considered 'Medium' (tolerable), or 'Low' (acceptable), and has been demonstrated ALARP; and
- The activity (and associated potential risks and impacts) to the environment is consistent with relevant legislation, industry standards and guidelines, offshore practice or benchmarking, and Western Gas corporate policies, standards and procedures.

4.2.6 Environmental Performance

One of the key aims of the risk management process is to identify the appropriate control measures to reduce the impacts and risks of the activity to ALARP and to an acceptable level. Establishment of environmental performance outcomes, environmental performance standards and their associated

measurement criteria of these control measures is a process that also considers legal requirements, relevant guidelines and stakeholder views. The environmental performance outcomes, environmental performance standards and their associated measurement criteria must be consistent with Western Gas' corporate policy and be:

- Specific: well defined and not open to interpretation;
- Measurable: can be measured and where possible in a quantitative manner;
- Achievable: can be met (i.e. realistic);
- Relevant: relate to the potential environmental impacts and risk of the activity; and
- Time-based: include a time component (where relevant).

Environmental performance outcomes, environmental performance standards and their associated measurement criteria are defined for each planned and unplanned event.

5 IMPACT ASSESSMENT OF PLANNED EVENTS

5.1 SECTION OVERVIEW

This Section provides an assessment and evaluation of the potential environmental impacts associated with planned events during the activity and details the control measures that will be applied to reduce impacts to ALARP and an acceptable level.

Table 5-1 provides a summary of the planned events impact assessment outcomes.

5.2 PLANNED EVENTS EXCLUDED FROM THE SCOPE OF THE ENVIRONMENT PLAN

The following planned events were not considered to be applicable within or outside of the notional Operational Area and were not further deliberated within the scope of this EP.

Lighting Emissions

Lighting will be used on the vessel at night for safe conduct of operations and to adhere to required maritime safety regulations. There are no standards by recognised bodies for acceptable levels of lighting to the most sensitive environmental receptors, which are generally considered to be seabirds or turtles. The most relevant is the WA EPA environmental assessment guideline for protecting marine turtles from light impacts (EPA, 2010[9]), which notes that the starting point for design should be to locate developments sufficiently far from the coast to ensure that lights are not visible from turtle nesting beaches or the adjacent sea. Other relevant considerations are comparison to good oilfield practice and professional judgement. The illumination of work areas is normal oilfield practice and necessary for safe operations. The Activity will occur approximately 180 km (97 nm) from Barrow Island and 148 km (78 nm) from the nearest mainland coast (North West Cape) in an open ocean environment. No sensitive receptors such as turtle nesting beaches or seabird roosting/ foraging habitat are known from within the Operational Area. On this basis, no effects of lighting on sensitive receptors are predicted.

Vessels in Transit to Permit Areas

The survey vessel will transit between either Exmouth or Dampier Port and the Operational Area. During transit, the vessels will be governed by the relevant marine legislation, outlined within vessel specific management plans which will be reviewed by Western Gas prior to mobilisation. The EP only covers the environmental impacts and risks associated with the vessel once the vessel is within the Operational Area.

9 Western Australian Environmental Protection Authority (2010). Environmental Assessment Guideline No. 5: Environmental Assessment Guideline for Protecting Marine Turtles from Light Impacts. Report accessed September 2014. http://edit.epa.wa.gov.au/EPADocLib/EAG%205%20Lights%20Turtle%2011110.pdf

Table 5-1: Summary of impact assessment of planned events

Activity		Biological Environment Affected						Socio-Economic Environment Affected				Impact Assessment
		Whales	Turtles	Fish/ Sharks	Seabirds	Seabed	Marine Biota	Commercial Fisheries	Shipping Activities	Tourism	Greenhouse Gas	Severity
Section 5.3	**Physical Presence**											
	Timing and location of vessel	-	-	-	-	-	-	✓	✓	-	-	Slight
	Presence of subsea infrastructure	-	-	-	-	-	-	✓	-	-	-	
Section 5.4	**Seabed Disturbance**											
	Anchoring of vessel	-	-	-	-	✓	-	-	-	-	-	Slight
	Manoeuvring of ROV					✓						
	Placement of wellhead	-	-	-	-	✓	-	-	-	-	-	
Section 5.5	**Noise Emissions**											
	Routine vessel operations (incl. thrusters if using DP system, ROV)	✓	-	-	-	-	-	-	-	-	-	Slight
Section 5.6	**Atmospheric Emissions**											
	Survey vessel's machinery and engines, generators and mobile/ fixed plant and equipment	-	-	-	-	-	-	-	-	-	✓	Slight
Section 1.1	**Routine Liquid Waste Discharges**											
	Sewage	-	-	-	-	-	✓	-	-	-	-	Slight
	Grey water	-	-	-	-	-	✓	-	-	-	-	
	Reverse osmosis brine	-	-	-	-	-	✓	-	-	-	-	
	Cooling water	-	-	-	-	-	✓	-	-	-	-	
	Bilge water	-	-	-	-	-	✓	-	-	-	-	
	Deck drainage	-	-	-	-	-	✓	-	-	-	-	

Activity		Biological Environment Affected						Socio-Economic Environment Affected				Impact Assessment
		Whales	Turtles	Fish/ Sharks	Seabirds	Seabed	Marine Biota	Commercial Fisheries	Shipping Activities	Tourism	Greenhouse Gas	Severity
	Food/ putrescible waste	-	-	-	-	-	-	-	-	-	-	
Section 5.8	**Solid Waste Discharge**											
	General (non-hazardous) waste	✓	✓	✓	-	✓	-	-	-	-	-	Slight
	Hazardous waste	✓	✓	✓	-	-	-	-	-	-	-	

5.3 PHYSICAL PRESENCE

The entire survey is expected to take approximately 72 hours, with approximately 6 hours related to inspection activities at each well head.

The physical presence of the survey vessel at the well sites during inspections may interfere with other users of the area which may include shipping traffic, commercial fishers and defence. The vessel presence may force temporary diversion of the routes of these other sea users from the area.

Once the survey is completed, the vessel will demobilise from the permit areas. The wells will remain suspended with the well heads in place on the seabed.

5.3.1 Potential Impacts

An established shipping fairway traverses both permit areas, however, all five wells are outside the fairway. The well heads do not have an elevation that could pose any risk to vessel movements, but there is the potential for some minor (localised) displacement of commercial shipping and/or defence vessels outside the fairway if it was traversing the Operational Area during ROV activities. The very short duration of inspection activities at each well would restrict the potential for disruption.

Petroleum activities on the NWS have been ongoing for many years and therefore other users of the sea are familiar with the requirement to navigate around vessels that are holding position while undertaking works. As such, the potential impact arising from the disruption to commercial shipping and defence is considered to be low. Potential impacts associated with vessel collisions are discussed in Section 6.1.5.

Given the water depth and the distance from the nearest shoreline, recreational fishing is not anticipated in the permit areas. However, the presence of the vessel during the survey and of the well heads on the seabed has the potential to displace commercial fishing activity.

There are four Commonwealth (Southern Bluefin Tuna, Western Deepwater Trawl, Western and Billfish and North West Slope Trawl Fishery) and one State commercial fishery (Mackerel Managed Fishery) that operate within the vicinity of the Operational Area. The State fishery does not have significant catches beyond the 100 m isobath while the Commonwealth fisheries tend to operate in deep water between the 200 m isobaths and the outer limit of the Australian Fishing Zone (refer to Section 3.4.4).

For the period that the well is suspended, subsea infrastructure will remain on the sea floor (i.e. above the mudline) consisting of the well head system (including suspension cap) and a mud-mat[10], until such time when the well is permanently abandoned. This subsea infrastructure has the potential to cause

[10] A mud mat was utilised on each of the wells in WA-70-R, but not on the well in WA-474-P.

displacement/disruption to commercial fishers, as well as cause damage to fishing gear. With the well head locations marked on marine charts and/or cited in notices to mariners, damage to gear could be readily avoided through fishing vessel navigation. The small size of the well head structures and the very short duration of inspection activities suggests the scale of disruption to fishing activity in the region would be minimal.

Overall, the severity of the impact to commercial shipping, commercial fishing and defence with standard controls in place is considered to be 'slight' on the Western Gas Risk Matrix.

5.3.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for the physical presence of the vessel and well heads is presented in Table 5-2.

The impact assessment and evaluation has identified a range of existing standard controls and additional controls that when implemented are considered to manage the impacts of the Activity on other users to an ALARP level. As no further alternative or additional reasonable control measures were identified and the potential consequences are 'slight', impacts from Physical Presence are considered to be reduced to ALARP.

Table 5-2: ALARP assessment for physical presence

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A			
Substitute	N/A			
Engineering	Navigation (including lighting, compass/radar), bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012 (or equivalent).	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.1**
	Navigational aids (AIS) will alert marine vessels and aircraft of position of the survey vessel to avoid collision, and alert survey vessel personnel of impending collision.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.1**
	Bridge-watch on vessel to be maintained 24-hours per day.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.1**

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Administrative	Crew undertaking vessel bridge-watch qualified in accordance with International Convention STCW95; AMSA Marine Order – Part 3: Seagoing Qualifications or certified training equivalent.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.1**
	Notification of vessel location, duration of activities, etc. to AMSA Rescue Coordination Centre (RCC), which triggers RCC to issue an AusCoast Warning, and to the Australian Hydrographic Service (AHS) who will issue a 'Notice to Mariners'.	A	Operator established control. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.2**
	Stakeholders potentially affected by the Activity will be consulted/ advised of relevant activities associated with suspended wells.	A	Operator established control. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.3.3**
Pollution Control	N/A			
Additional Controls				
	Notification that the well is temporarily suspended to stakeholders, including AHS who will issue a 'Notice to Mariners' and/or mark the wells on marine charts as appropriate. Notification to include positional coordinates of well heads.	A	Operator established control. Control is feasible, standard practice with benefits outweighing any cost sacrifice	**PS 5.3.4**
	Stakeholders potentially affected by the inspection survey will be advised of confirmed survey dates at least one month prior to commencement.	A	Operator established control. Control is feasible, standard practice with benefits outweighing any cost sacrifice	**PS 5.3.3**

5.3.3 Acceptability

The area affected represents a relatively small area available for shipping and fishing activity. Given that the wells are not located in a designated shipping fairway, the limited fishing activity near the area, the very short duration of the inspection survey (approximately 6 hours at each well), the effect of the physical presence of the vessel on other marine users is considered to be acceptable on the basis of a 'slight' impact. There will be no significant impacts other than short-term and localised displacement to commercial and to some local coastal marine vessel traffic. The impacts were considered acceptable with the industry standard controls implemented. On this basis, it is considered that the controls in place will manage the impacts of the physical presence of the vessel and well heads on other sea users to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

5.4 SEABED DISTURBANCE

It is intended that the wells will be left in suspension and the well heads remain in place on the seabed. The well heads will displace an area of seabed equivalent to their footprint for the duration of the Activity and potentially cause localized disturbance (scouring or accretion) of immediately surrounding areas. During the inspection survey, seabed disturbance can result from anchors and ground chains contacting the seabed for positioning of the survey vessel, or from manoeuvring of the ROV. The impact of seabed disturbance from unplanned dropped objects overboard are discussed in Section 6.4.

One vessel will remain at the well location for the duration of the inspection survey. The vessel will have dynamic positioning (DP) capability and no anchoring will be undertaking during the inspection of the well heads.

5.4.1 Potential Impacts

The survey vessel will be required to have a dynamic positioning (DP) capability and no anchoring will be undertaking during the inspection of the well heads. Consequently, there will be no impacts to the seabed from the vessel. Given the frequency and duration of the ROV surveys, the small potential area of disturbance associated with ROV activity will have negligible impacts.

The subsea infrastructure remaining on the sea floor (i.e. above the mudline) at each well site consists of the well head system (including suspension cap) and, for 4 of the wells, a mud-mat. The associated seabed footprint is approximately 9 m^2 for each well (i.e. 45 m^2 in total for all 5 wells). The continued presence of this infrastructure is not likely to alter the extent of existing impacts to benthic habitats, as the well heads have been in place for some time but will effectively defer recovery for the duration of the Activity. Localised changes to water movements may also affect the areas immediately surrounding the mud-mats through erosion or accretion of sediments. However, at the depths prevailing at the well sites, water movements are unlikely to generate sufficient currents for this effect to be significant.

The severity of the impact to benthic habitats is affected by their complexity and density of associated biota. The seabed across the permit areas is considered to be essentially featureless with sediments

which support burrowing infauna and sparse epifauna (Margvelashvili, 2006[11]). In 2012, a review of the information available on the biophysical benthic habitats within the then Permit Area WA-390-P (which WA-70-R falls within) was commissioned by Hess (RPS, 2012[12]). The review combined site-specific survey data collected by Hess, data collected from other developments in the vicinity of the permit area and publicly available regional datasets. Based on the seabed surveys undertaken at those sites, the seabed typically consists of a homogenous substrate of biogenic calcareous ooze typical of similar habitats found at these depths throughout the NWS region, with habitat and assemblages well represented in the region and of low conservation value. No rare, endangered, isolated species or habitat of significance was present within the permit area. The soft sediments contain infauna and macro-invertebrates typical of the habitats in these depths on the NWS (RPS, 2012[13]).

Given the widespread habitat distribution, the localised seabed disturbance footprint, and the ability of existing habitat to recover once the Activity ceases, the impact to seabed is considered to be 'slight'.

The Exmouth Plateau Key Ecological Feature (KEF) overlaps with the permit areas. The Exmouth Plateau KEF is a regionally and nationally unique deep-sea plateau that may modify the flow of deep waters, generating internal tides and may contribute to upwelling of nutrients, thus serving an important ecological role. Given the extent of the potential seabed disturbance (~45 m^2) in relation to the extent of the Exmouth Plateau (~5,000 km^2) (Baker *et al*., 2008[14]), the impact to the KEF is considered to be 'slight'.

Overall, the severity of the seabed disturbance from continued presence of the well heads is considered to be 'slight' on the Western Gas Risk Matrix.

5.4.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for seabed disturbance arising from placement of the well head and anchoring of the survey vessel is presented in Table 5-4.

The impact assessment and evaluation has identified standard controls that when implemented are considered to manage the impacts from the well head placement, ROV manoeuvring and vessel anchoring resulting in seabed disturbance to an ALARP level. With the size of the survey vessel, the deep waters at the well sites and the very short duration of activity at each site, DP is considered a preferred alternative to anchoring. The ROV is required to approach the well heads to conduct

11 Margvelashvili, N (2006) Modelling suspended sediment transport on Australia's North West Shelf. CSIRO. Marine and Atmospheric Research. North West Shelf Joint Environmental Management Study Western Australia

12 RPS (2012) Marine Benthic Habitat Review. Hess Equus Project. Permit WA-390-P and Pipeline Corridors. Prepared by RPS for Hess Exploration Australia Pty Ltd.

13 Ibid.

14 Baker, C., Potter, A., Tran, M. & Heap, A.D. (2008). Geomorphology and sedimentology of the Northwest Marine Region of Australia. Geoscience Australia, Record 2008/07. Geoscience Australia, Canberra.

inspections. As the well heads are already in place and their removal would require permanent plugging and abandonment of the wells to have been completed, there is no reasonable alternative to having the well heads on the seabed while the wells are suspended. The inherent impacts to seabed habitats from the presence of the well heads while the wells remain suspended and the ROV activities are minimal. With no reasonable additional controls identified to reduce environmental impact, the impacts are 'slight' and considered to be reduced to ALARP.

Table 5-3: ALARP assessment for seabed disturbance

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	Dynamic Positioning (DP) System as method for station keeping of the survey vessel.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice	**PS 5.4.1**
Engineering	N/A	A		
Administrative	Survey vessel will not anchor in the Operational Area during normal operations.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice	**PS 5.4.2**
	ROV will not contact seabed outside mud-mat during normal operations	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice	**PS 5.4.3**
Pollution Control	N/A			

5.4.3 Acceptability

Leaving well heads in place on suspended wells is consistent with Western Gas policies and procedures and is standard industry practice on the North West Shelf (and elsewhere). The seabed in the permit areas is composed of fine sediments that are considered to be colonised by low density benthic fauna. When considered in the context of similar seabed habitat widely represented on the shelf slope in the region, the portion of seabed directly affected is extremely small. As no significant impacts are expected, with seabed disturbance being localised, the impacts were considered 'slight' and ALARP, the controls in place will manage the impacts associated with seabed disturbance to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

5.5 NOISE EMISSIONS

During the monitoring survey, noise will be generated by the vessel propellers/thrusters and associated machinery/engines, as well as by the ROV.

5.5.1 Vessel Generated Noise

Under normal operating conditions when the vessel is idling or moving between stations, vessel noise would be detectable only over a short distance. The noisiest situation is when the vessel is using main engines and thrusters to hold position such as during the ROV survey. McCauley (1998) [15] measured highest underwater noise to approximately 182 dB re 1µPa at 1 m from a support vessel when holding position in the Timor Sea. The noise level reduced to approximately 137 dB re 1 µPa at 405 m (0.22 nm) and to 120 dB re 1µPa when measured 3−4 km (1.6−2.2 nm) away from the source.

McCauley and Duncan (2003) [16] recorded underwater vessel noise exceeding 120 dB re 1 µPa at 5 km (12.7 nm) for only 0.7% of the time.

5.5.2 Potential Impacts

Underwater noise has the potential to adversely affect marine fauna and in extreme cases cause physiological harm. Underwater noise generated by the Activity may impact on marine fauna by:

- Causing behavioural changes including displacement from biologically important habitat areas (such as feeding, resting, breeding, calving and nursery sites);
- Masking or interference with other biologically important sounds such as communication or echolocation systems used by certain cetaceans for navigation and location of prey;
- Causing physical injury to hearing and other internal organs; and
- Indirectly impacting on predator or prey species.

Although cetaceans, marine reptiles and migratory shark species may occur in the Operational Area, it (and surrounding permit areas) does not contain significant feeding, breeding or resting areas. Therefore, any species that do occur will be transient and migrating through the area on their way to feeding, breeding and/or nesting areas.

15 McCauley, R.D. (1998). Radiated underwater noise measured from the drilling rig Ocean General, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Venture and natural sources in the Timor Sea, Northern Australia. Report to Shell Australia.

16 McCauley, R.D. and Duncan, A.J. (2003). Underwater acoustic environment. Otway Basin, Victoria. Prepared for Woodside Energy and Curtin University Centre for Marine Science and Technology.

5.5.2.1 Cetaceans

In 2011/2012, underwater acoustic measurements conducted by Hess in permit area WA-390-P (now WA-70-R) between April – July and October – January detected several pygmy blue whale vocalisations, with a peak from early November to late December which corresponds to the reported southbound migration period for the species. The sound intensity levels of these recordings indicated that the pygmy blue whales were approximately 10 – 50 km (5.4 – 27 nm) from the noise loggers, located approximately in the centre of the permit area (RPS, 2010[17]).

Noise generated is not expected to affect toothed cetaceans. However, baleen whales are sensitive to marine noise due to their use of low-frequency signals (range 12 Hz – 8 kHz but predominantly <1 kHz) for communication. Studies on a baleen whale (e.g. humpback whales) suggested that migration behaviour may be disturbed by levels of sound at 150 dB re 1 µPa (NRC, 2003[18]). The blue whale's migration route is known to overlap the permit areas and hence may potentially be affected by similar sounds levels. Whales in feeding, breeding or resting areas may be sensitive to levels of 140 dB re 1 µPa (DEWHA, 2008b[19]).

For baleen whales, the threshold for physical injury (defined as the onset of permanent threshold shift) from pulse and non-pulse sources has been estimated by Southall *et al*. (2007) [20] as occurring at the received sound exposure levels of 198 dB re 1 µPa and 215 dB re 1 µPa respectively. The approach of Southall *et al*. (2007) [21] recognises that even if the initial received levels are not great enough to cause injury, harmful effects can result from lower level sounds which last for a longer duration. A whale swimming past the vessel would not receive cumulative sound exposure level (SEL) sufficient to cause physiological effect.

Southall *et al*. (2007) [22] conducted a comprehensive review of data published describing behaviour of marine mammals in response to sound. They defined the threshold for behaviour response as being, "Moderate changes in locomotion speed direction and/or dive profile but no avoidance of the sound source, brief minor shift in group distribution and moderate cessation or modification of vocal behaviour". The review of published data suggests that threshold for behaviour response is highly

17 McCauley, R.D. and Duncan, A.J. (2003). Underwater acoustic environment. Otway Basin, Victoria. Prepared for Woodside Energy and Curtin University Centre for Marine Science and Technology.

18 National Research Council (NRC) (2003). Ocean noise and marine mammals. Summary review for the National Academies National Research Council. The National Academies Press, Washington D.C., United States.

19 Department of Water, Environment, Heritage and the Arts (DEWHA). (2008b). North-west Marine Bioregional Plan – Bioregional Profile: A description of ecosystems, conservation values and uses of the North-west Marine Region. DSEWPaC, Canberra, ACT. Available to download from: http://www.environment.gov.au/resource/north-west-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation.

20 Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.T., Gentry, R.L., Greene Jr., C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33(4): 411-521.

21 Ibid.

22 Ibid.

variable between species, within species and even the same individual animal at different times. For baleen whales the threshold for behavioural response occurs at received sound level of between 120 to 160 dB re 1 uPa.

5.5.2.2 Turtles

A study by Eckart *et al*. (2006) [23] on leatherback turtles addresses threshold shift in turtles. This study demonstrated that turtles will suffer temporary threshold shift and eventually permanent threshold shift from noise (seismic) impulses with sound exposure levels greater than 185 dB re 1 uPa2.s. A turtle would need to approach within 100 m (0.05 nm) or remain at 1 km (0.5 nm) for a period of approximately 26 minutes for physiological impact to occur. Neither of these is considered to be a credible scenario with the current control mechanisms in place. A turtle swimming past the vessel would need to pass within 1 m (0.001 nm) to receive cumulative SEL sufficient to cause physiological effect. Turtle hearing is most sensitive in the frequency range of 100–700 Hz.

Sea turtles have been recorded as demonstrating a startle response to sudden noises (Lenhardt *et al*., 1983[24]). However, few studies have investigated threshold level necessary for behavioural effects. Early work by O'Hara and Wilcox (1990) [25] looked at the use of noise as acoustic deterrents. They found that airguns with a source level of approximately 220 dB re 1µPa at 1m (measured in the 25 to 1000 Hz range) were effective as a deterrent for a distance of about 30 m (0.016 nm). Moein *et al*. (1995) [26] also used airguns to investigate means to repel loggerhead turtles. Avoidance was observed at 175 dB re 1µPa at 1m exposure. McCauley *et al*. (2000) [27] found behavioural avoidance at 155 to 164 dB re 1 uPa2.s.

5.5.2.3 Fish

There is a wide range of susceptibility to noise pulses among fish. The primary factor likely to influence susceptibility is the presence or absence of a swim bladder. Generally, fishes with a swim bladder will be more susceptible than those without this organ. Many adult fishes, including the elasmobranchs (sharks, rays and sawfish) do not possess a swim bladder and so are not susceptible to swim bladder-

23 Eckert, S.A., Bowles, A. and Berg, E. (1998). The effect of seismic airgun surveys on leatherback sea turtles (*Dermochelys coriacea*) during the nesting season. Technical report to BHP (Petroleum) Trinidad Ltd.

24 Lenhardt, M.L., Bellmund, S., Byles, R.A., Harkins, S.W. and Musick, J.A. (1983). Marine Turtle reception of bone conducted sound. Journal of Auditory Research, 23: 119-1125.

25 O'Hara, J. and Wilcox, J.R. (1990). Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. Copeia, 1990(2):564-567.

26 O'Hara, J. and Wilcox, J.R. (1990). Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. Copeia, 1990(2):564-567.

27 McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K. (2000). Marine seismic surveys – A study of environmental implications. APPEA Journal 2000, pp. 692-708.

induced trauma. Using a similar approach to the DEWHA Policy Statement (DEWHA, 2008a[28]) and the derived relationship of Hastings and Popper (2005) [29] threshold criteria for physiological harm has been calculated to be:

- For a 0.1 kg fish: single exposure of 199 dB re 1 µPa2.s; and
- For a 1 kg fish: single exposure of 200 dB re 1 µPa2.s.

Most pelagic fish are expected to exhibit avoidance behaviour and swim away when noise reaches levels at which it might cause physiological effects. Available evidence suggests that behavioural change for some fish species may be no more than a nuisance factor. These behavioural changes are localised and temporary with displacement of pelagic or migratory fish populations having insignificant repercussions at a population level (McCauley, 1994[30]).

A whale swimming past the survey vessel holding station would not receive cumulative sound exposure level sufficient to cause temporary threshold shift, however a turtle may if it approaches closer to within 1 m (0.016 nm) of the vessel. Temporary threshold shift is, by definition, a short-term temporary effect and does not represent long-term harm to the individual animal.

The proximity at which behavioural effects may commence for whales, turtles and fish is summarised in Table 5-3.

Table 5-4: Predicted range within which behavioural effects (including avoidance) may commence for whales, turtles and fish

Operations	Whale	Turtle	Fish
Vessel in Holding Position	0 – 3,000 m (0 – 0.16 nm)	0 – 300 m (0 – 0.016 nm)	0 – 50 m (0 – 0.025 nm)

5.5.3 ALARP Demonstration

A summary of the ALARP assessment undertaken for the impacts associated with noise emissions is presented in Table 5-5.

The impact assessment and evaluation has identified a range of existing standard controls including legislative requirements and those that represent industry practice, that when implemented are considered to manage the noise impacts from the Activity to ALARP. The proposed inspection survey requires a vessel at the well heads which will inevitably generate noise. The use of machinery and

28 Op cit **Error! Bookmark not defined.**.

29 Popper, A.N. and Hastings, M.C. (2009). Review Paper: The effects of anthropogenic sources of sound on fishes. Journal of Fish Biology, 75: 455-489.

30 McCauley, R. D (1994). The environmental implications of offshore oil and gas development in Australia – seismic surveys. In: Swan, J.M., Neff, J.M. and Young, P.C. (eds). Environmental Implications of Offshore Oil and Gas Development in Australia. – The findings of an Independent Scientific Review. pp. 19-122. Australian Petroleum Exploration Association, Sydney.

equipment on the vessel is necessary for operations and the ROV is essential to undertake the inspections. With no reasonable additional controls identified, other than not proceeding with the well head inspections, it is considered that the impacts due to noise emissions have been reduced to ALARP.

Table 5-5: ALARP assessment for noise emissions

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Engineering	N/A			
Administrative	Vessels to be operated in accordance with the EPBC Regulations 2000 Part 8 Division 8.1 (Regulation 8.05) to avoid interactions with cetaceans and whale sharks.	A	Legislative requirement - control is feasible, standard practice with benefits outweigh any cost sacrifice	**PS 5.5.1**
	Environmental awareness induction provided to vessel crew to advise marine fauna interaction requirements.	A	Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.5.2**
Pollution Control	N/A			
Additional Controls				
Eliminate	N/A			
Substitute	Prevent or reduce use of vessels/ROV during peak cetacean migration periods.	R	The use of vessels/ROV is essential for the Activity. The very short duration of the inspection activity makes the risk of impact extremely low. Restricting scheduling options could complicate logistic arrangements and affect the availability/cost of a suitable vessel, particularly given the desire to source a vessel operating locally, for negligible environmental benefit.	

5.5.4 Acceptability

With the management controls in place to manage the noise generated during the monitoring survey, including vessel protocols and adherence to the fauna interaction requirements in accordance with Part 8 Division 8.1 of the EPBC Regulations 2000, general noise emissions are not expected to significantly impact on marine fauna within the receiving environment. Marine fauna such as cetaceans and turtles are considered transitory species and will not remain in the area.

The behavioural effects that may arise are not considered likely to cause significant effects at the population level, as defined by the EPBC Act Significance Guidelines (DoE, 2013[31]). The permit areas are not known to provide significant feeding or breeding areas for marine mammals, turtles or fish.

[31] Department of the Environment (DoE) (). Matters of National Environmental Significance. Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999. Available from:

Overall, the impact of noise on marine fauna is predicted to be 'slight'. Given the control measures in place for the management of noise, the very short duration of the noise generating activity (approximately 6 hours at each well) and that the levels of noise generated from the monitoring survey are typical of offshore vessel activities undertaken elsewhere and in Australian waters, the impacts from noise to marine fauna are considered to be acceptable.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

5.6 ATMOSPHERIC EMISSIONS

Machinery and vessels associated with the monitoring survey will be powered by internal combustion engines and will generate atmospheric emissions, principally CO_2. Less significantly, air pollutants such as NOx and SOx may also be emitted.

The average diesel fuel usage is expected to be in the order of 1,000 L per day, totalling 3,000 L for the planned Activity. The atmospheric emissions have been calculated using E&P Forum (1994)[32] methods (assuming one vessel in continuous use) and are presented in Table 5-5.

Table 5-6: Estimated atmospheric emissions from a vessel

Emission	Vessel (tonnes/day)	Total for Activity (tonnes)
CO_2	6.537	19.611
SOx	0.002	0.006
NOx	0.140	0.42

5.6.1 Potential Impacts

Atmospheric emissions generated during the monitoring survey will result in a localised, temporary reduction in air quality in the environment immediately surrounding the emission point and contribute to the global greenhouse effect. Gaseous emissions under normal circumstances quickly dissipate into the surrounding atmosphere.

http://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf..

[32] Methods for Estimating Atmospheric Emissions for E&P Operations', The Oil Industry International Exploration and Production Forum, Report No. 2.59/197, September, 1994.

Potential receptors in the immediate area exposed to reduced air quality, other than workers associated with the survey, are seabirds. Given the offshore location of the well heads and with the nearest landfall with important habitat being Barrow Island (~180 km [97 nm]), the impact of atmospheric emissions on seabirds is considered to be insignificant.

5.6.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for atmospheric emissions is presented in Table 5-6.

The impact assessment and evaluation has identified a range of existing standard controls that when implemented are considered to manage the atmospheric emissions impacts due to the planned Activities. The monitoring survey cannot occur without a vessel on site which requires fuel for power, mobile plant and equipment. Power generation through the combustion of conventional fuels is essential to power the vessel thrusters, mobile plant and equipment. An alternative fuel source (solar, wind, biofuels) has not been commercially proven for use in large vessels. With no reasonable additional controls identified, other than not proceeding with the survey, and adoption of the standard industry controls including legislative requirements and Marine Orders and the use of low sulphur diesel fuel, the impacts from atmospheric emissions are considered to be reduced to ALARP.

Table 5-7: ALARP assessment for atmospheric emissions

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Substitute	N/A			
Engineering	Machinery/ equipment/ engines onboard the vessel are maintained based on a planned maintenance programme.	A	Control is feasible, standard practice with minimal cost. Benefits outweighing any cost sacrifice.	**PS 5.6.1**
Administrative	Vessel bunkering will use marine-grade diesel (sulphur content of less than 3.5%) as the primary fuel source.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.6.2**
	Vessel hold a current IAPP Certificate indicating that they meet the requirements of MARPOL Annex VI.	A	Legislative requirement - control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.6.3**
	Vessel engines will meet NOx emission levels as required by Regulation 13 of MARPOL Annex VI.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.6.4**
	Ozone-depleting substances will be managed in accordance with Regulation 13 of MARPOL Annex VI.	A	Legislative requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.6.4**
Pollution Control	No waste incineration onboard the vessel	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.6.5**

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Additional Controls				
Eliminate	Use of renewable energy to power vessel.	R	Large vessels require a reliable and steady fuel supply. At present no renewable powered vessel that meet those criteria is available or commercially viable.	

5.6.3 Acceptability

The Activity is in an area where air emissions will disperse and rapidly assimilate with the surrounding environment and given the distance from any sensitive habitats and the short duration of the survey (~6 hours at each well), the impacts to air emissions are considered 'slight'. Atmospheric emissions from vessels in Australian waters are permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which reflect MARPOL Annex VI requirements. The proposed controls are consistent with relevant legislation, industry standards/guidelines and international maritime regulations, and are in line with standard controls for offshore petroleum activities. As such, it is considered that the controls and management measures in place will manage the predicted impacts associated with atmospheric emissions to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

5.7 ROUTINE LIQUID DISCHARGES

During the inspection survey, the vessel will produce the following liquids discharges:

- Sewage;
- Grey water;
- Food/putrescible waste;
- Brine (from the water treatment plant);
- Cooling water; and
- Deck drainage and bilge water.

As the Operational Area is located more than 22 km (12 nm) from the territorial baseline, these liquid wastes will be discharged to the marine environment as permitted under MARPOL Annex IV and V.

5.7.1 Sewage, Grey Water and Food/Putrescible Waste

The average volume of sewage and grey water (water from galley sinks, laundry facilities, showers and washbasins) generated per person per day is 100 litres, and approximately 30-40 kg in total of food waste is generated per day.

The discharge of sewage and food waste in Australian waters is permissible under the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* if in accordance with conditions stipulated in Part IIIB and Part IIIC. Treated sewage will be disposed of overboard through a MARPOL certified sewage treatment plant. Food waste produced onboard the vessel will either be macerated to less than 25 mm (0.98") prior to discharge overboard or collected and transferred on return to port at a licenced waste facility.

5.7.2 Brine

Depending on the contracted vessel, potable water may be produced onboard the vessel using reverse osmosis machinery. Reverse osmosis is a membrane-technology filtration method that removes salt molecules and ions from seawater by applying pressure to the solution when it is on one side of a selective membrane. The result is that a brine solution with salinity elevated by approximately 10% is retained on the pressurised side of the membrane and the potable water is allowed to pass to the other side. The brine wastewater stream will also contain residual anti-scalant (cleaning agent) used in the cleaning of the potable water supply system. The volume of brine solution discharged is dependent on the requirement for potable water and would vary dependent on the number of people onboard the vessel.

Conversely, due to the very short time frame of the planned Activities, the vessel may carry enough potable water for the duration of the survey and therefore negate the requirement to create potable water.

5.7.3 Cooling Water

Depending on the contracted vessel, seawater may be used as a heat exchange medium for the cooling of machinery engines on board the vessel.

Seawater is pumped onboard the vessel through heat exchangers and is subsequently discharged at the sea surface with a temperature elevation of 2-5 ^{o}C above ambient. The seawater intake is dosed with a biocide (chlorine) to control marine fouling of the cooling water system. Chlorine will not be discharge directly to sea; the majority of chlorine will be neutralised within the cooling water systems.

The cooling water discharge points vary on each vessel, although they all adopt the similar discharge design that allows cooling water to be discharged above the water line in order to facilitate cooling and oxygenation of this wastewater stream before mixing with the surrounding waters.

5.7.4 Deck Drainage and Bilge Water Discharges

Deck drainage from rainfall and wash down activities on the deck may contain particulate matter and residual chemical residues, such as detergent, oil and grease, and hydraulic fluid. Deck drainage is diverted to a deck drainage system and discharged overboard.

Oily water from machinery spaces and bunded areas is directed to a bilge water holding tank, treated and released overboard or stored for appropriate disposal.

5.7.5 Potential Impacts

The discharge of sewage, grey water, food waste, brine, cooling water and oily water to the marine environment could affect water quality and marine biota in surface waters. The changes in water quality may include:

a) Increased turbidity in the water column which may temporarily inhibit photosynthesis by phytoplankton by decreasing light availability in surface waters;
b) Nutrient enrichment of surrounding waters potentially resulting in localised oxygen depletion and phytoplankton blooms;
c) Elevated salinity and water temperature which may impact phytoplankton and sensitive marine fauna close to the source; and
d) Acute toxicity effects on marine fauna or bioaccumulation of toxins.

5.7.5.1 Sewage, Grey Water and Food/Putrescible Waste

The discharges of these waste streams will result in a localised increase in nutrients levels and biological oxygen demand of the receiving marine waters. However, no significant impacts are expected from these discharges given the biodegradable nature of the waste, the small volumes released relative to the receiving environment's assimilative capacity, lack of nearby habitats sensitive to any nutrient

increases and the highly dispersive nature of the receiving ocean environment. The North West Shelf is characterised as a highly productive ecosystem in which nutrients and organic matters are rapidly recycled (Furnas and Mitchell, 1999[33]). Hence the daily nutrient loadings are inconsequential in comparison to the daily turnover of nutrients that takes place. Based on these factors, the impact of these discharges on the marine environment is considered to be 'slight'.

5.7.5.2 Brine

The brine solution will be quickly dispersed and diluted to undetectable levels within a few metres of the discharge point. The area of detectable change in water quality is likely to be less than 10 m radius. Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20-30% (Walker and McComb, 1990[34]).

Given the relatively low volume of discharge, very short duration of the activity, relatively localised low increase in salinity, significant water depth and open ocean environment, the discharge of brine is expected to have an insignificant effect on water quality and the potential impact to the marine environment is considered to be 'slight'.

5.7.5.3 Cooling Water

Cooling water discharged will be subject to turbulent mixing and rapid loss of heat to the surrounding waters. The area of detectable increase in seawater temperature is likely to be less than 10 m radius.

Given the low temperature differential and the rapid mixing with the surrounding marine environment, the change in water quality due to cooling water discharge is considered to be short-term and the potential impact on the marine environment is considered to be 'slight'.

The majority of biocide (chlorine) will be neutralised within the cooling water systems. On discharge, the low residual concentrations of chlorine in the cooling water discharges will be rapidly diluted by the prevailing current. Given the relatively low discharge volumes and open ocean conditions resulting in rapid mixing, the change in water quality is expected to be short-term and the potential impact on the marine environment is considered to be 'slight'.

5.7.5.4 Deck Drainage and Bilge Water Discharges

Drainage from areas of a high risk of hydrocarbon or chemical contamination will be managed via a closed drainage system that drains to a tank where it is treated such that the oil in water content is less than 15 ppm prior to discharge overboard in accordance with MARPOL Annex I (Oil) enacted in

33 Furnas, M.J. and Mitchell, A.W. (1999). Wintertime carbon and nitrogen fluxes on Australia's North West Shelf. Estuarine, Coastal and Shelf Science, 49: 165-175.

34 Walker D.I. and McComb A.J. (1990). Salinity response of the seagrass *Amphibolus Antartica*: an experimental validation of field results. Aquatic Botany 36: 359–366.

Commonwealth water by the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, or sent to shore for disposal.

Potential impacts from acute toxicity effects would be limited to passive marine biota (i.e. planktonic organisms and fish larvae) that become entrained in the waste stream; mobile marine fauna such as fish would be able to move away from the area.

Due to the small volumes of deck drainage, the very low levels of contaminants likely to be entrained in the discharge and the rapid dilution and dispersal that will result at the oceanic location, the environmental effects will be temporary, localised and limited to the surface waters (<5 m). Temporary reduction in water quality due to the discharge of oily water and the effect on the marine environment is considered to be 'slight'.

5.7.6 ALARP Demonstration

A summary of the ALARP assessment undertaken for the impacts associated with routine liquid waste discharges is presented in Table 5-7.

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the impacts of routine liquid waste discharges during the Activity on the marine environment. The onboard treatment of liquid wastes and their discharge to the marine environment are consistent with all relevant codes and standards and are considered to be a more environmentally sound method of disposal compared to onboard storage and transport back to shore for disposal at suitable waste facilities.

Several alternative controls were considered:

1. Ship to shore of food waste: This would involve the containment of food wastes offshore and then shipping them to shore for disposal. While this option avoids the discharge of food wastes to sea it merely moves the environmental impact to another location rather than reducing it. No net environmental benefit would accrue from this option; and
2. Incineration of food wastes onboard: While this option avoids the discharge of food wastes to sea, it has substantial safety risk, associated with fire onboard the vessel, and has been discounted as impracticable.

With the implementation of standard and appropriate management controls and with no other additional controls or alternatives available that would offer a net environmental benefit, it is considered that the impacts of liquid waste discharges to the marine environment have been reduced to ALARP.

Table 5-8: ALARP assessment for routine liquid discharges

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A			
Substitute	N/A			
Engineering	N/A			
Administrate	Current International Sewage Prevention Pollution Certificate onboard vessel.	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.9.1**
	Current International Oil Prevention Certificate onboard vessel.	A	Legislative and/or Marine Orders requirement -control is feasible, standard practice with benefits outweigh any cost sacrifice	**PS 5.9.2**
Administrative	Where Offshore Chemical Notification Scheme (OCNS) rating of D or E or a CHARM rating of Silver or Gold rated chemicals are used that are intended to be released to the marine environment, no further control required. If non-rated chemicals are used that are intended to be released to the marine environment, chemical selection procedures outlined in Western Gas Chemical Risk Assessment Procedure (WG-EHS-PRO-001) will be followed.	A	Control based on Western Gas requirements must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.9.3**
	The sewage treatment plant onboard the vessel is maintained based on a Planned Maintenance System.	A	Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.9.1**
Pollution Control	No discharge of untreated sewage within 12 nm (22.2 km) of the territorial baseline, and no discharge of treated sewage within 3 nm (5.6 km) of the territorial baseline.	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with benefits outweigh any cost sacrifice	**PS 5.9.5**
	Macerate sewage and putrescible/food waste to less than 25 mm (0.98") prior to discharge when >3 nm (5.6 km) and <12 nm (22.2 km) from the territorial sea baseline.	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.9.5**
	Oily water discharged only if oil in water content does not exceed 15 ppm. If limit cannot be met, oily water waste is stored and transferred via licensed vessel for disposal onshore.	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.9.6**
Additional Controls				

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Eliminate	Store all putrescible or food waste onboard and ship to shore for disposal.	R	This option would be to contain food wastes offshore and ship them to shore for disposal with disproportionate financial costs and EHS risks. While this option avoids the discharge of food wastes to sea it merely moves the environmental impact to another location rather than reducing it. No net environmental benefit would accrue from this option	
Engineering	Incineration of putrescible/ food waste.	R	While this option avoids the discharge of food wastes to sea due to the potential volumes of waste it has substantial safety and exposure risk, associated with fire onboard the vessel and emission quality, and has been discounted as impracticable.	

5.7.7 Acceptability

Treated sewage, grey water, macerated food waste, brine, cooling water and oily water will be generated during the Activity. The release of these liquid wastes from vessels in Australian Commonwealth waters is permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which reflect MARPOL Annex I (oil pollution), IV (sewage) and V (garbage) requirements appropriate to vessel class.

Based on the alternatives considered, it was assessed that no net environmental benefit would result from their implementation and that the sacrifice involved made these options not in line with ALARP principles and therefore not considered further.

In determining acceptability, consideration has been given to the potential cumulative effects of different liquid discharges from multiple sources. The environmental impacts associated with the planned discharge of liquid wastes during the inspection survey are considered ‘Slight’ on the basis of no significant impact on the marine environment.

No reasonably practicable alternative controls have been identified or are currently available in Australia that would provide significant net environmental benefit. On this basis, it is concluded that implementation of the accepted controls for the discharge of liquid waste including compliance with relevant legislation, MARPOL requirements and relevant Marine Orders, which are internationally accepted and standard practice across the oil and gas industry in Australian waters, reduces the level of impact to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ Eternal Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

5.8 SOLID AND LIQUID WASTE

Vessels produce a variety of solid and liquid wastes (not discharged via the overboard drainage discharge system), including domestic and industrial wastes, such as aluminium cans, bottles, paper and cardboard, scrap steel and hazardous materials such as chemicals and chemical containers, batteries, waste oil and medical wastes. In situ cleaning of marine growth from the well heads, if required, will also generate some solid (organic) wastes. These materials could potentially impact the marine environment if discharged in significant quantities.

Waste is segregated onboard the vessel and stored in designated skips and waste containers. All waste will be managed, containerised and transported to shore for disposal in line with Western Gas Waste Management Plan (WG-EHS-PLN-005). Wastes are segregated into the following categories:

- Non-hazardous waste (or general waste)[35];
- Hazardous waste;

Solid waste onboard may unintentionally enter the marine environment from overfull bins, from bins that are not covered or have been left open, or items that have not been stored correctly, or overfilling and during adverse weather/sea state.

5.8.1 Non-Hazardous Waste

General non-hazardous waste includes domestic and galley waste and recyclables such as scrap materials, packaging, wood and paper and empty containers. Fouling growth on the well heads would likely comprise predominantly encrusting organisms such as sponges and barnacles, present in relatively small quantities. Volumes of non-hazardous waste generated on the vessel would be low due to the very short duration of the survey (expected 3 days in total).

[35] Recyclables and scrap metals fall under the non-hazardous waste for categorisation purpose.

5.8.2 Hazardous Waste

Hazardous wastes are defined as wastes that are or contain ingredients harmful to health or the environment. Hazardous wastes that may be generated by the vessel includes oil contaminated materials (e.g. sorbents, filters and rags), waste oil, hydrocarbon/chemical containers and batteries. The volumes of hazardous wastes expected to be generated are very small. All hazardous waste materials will be stored in appropriate containers, as per requirements of the safety data sheet (SDS) of the relevant hazardous material(s) in the waste.

5.8.3 Potential Impacts

Although hazardous waste presents a greater risk to the environment, it is generated in lower quantities compared to non-hazardous waste.

The *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* prohibits the disposal of waste into the sea except in the case of non-hazardous waste, such as putrescible food waste, sewage and grey water. Food waste must pass through comminuter or grinder so that the wastes are capable of passing through a screen with opening less than 25 mm (0.98") and discharged only when the ship is at a distance of not less than 3 nm (5.6 km) from the nearest land (refer to Section 5.7).

Ineffective management of solid wastes may result in pollution and contamination of the environment. Disposing of waste overboard would cause moderate impacts overtime. However, in line with the provisions of relevant legislation and Marine Orders, the only waste that is permissible to be discharged overboard from the vessel is food-waste, sewage and grey water (discussed in Section 5.7). All other waste (hazardous and non-hazardous) is stored, transported and disposed onshore. Fouling marine growth that may need to be removed from well head structures to facilitate inspections is expected to involve small volumes with high biodegradability. Therefore, during normal operations, impacts on the marine environment from routine solid waste are considered to be low.

The unintentional release of solid wastes to the marine environment could cause pollution and contamination, with either direct or indirect effects on marine organisms, including damage to benthic habitats through direct contact. Chemical effects such as physiological damage through ingestion or absorption may occur to individuals at the seabed, sea surface or within the water column.

Potential receptors affected by the solid waste include benthic habitats, fish, marine mammals, marine reptiles and seabirds. Any potential water quality changes caused by leaking chemicals and associated impacts to marine species (e.g. plankton, invertebrates, fish) are expected to be localised given hazardous wastes are likely to be in small quantities (e.g. batteries, chemical containers, oily rags). Release of non-hazardous solid wastes to the marine environment could also result in reduced water quality.

Marine fauna (e.g. fish, marine mammals, marine reptiles and seabirds) can also be harmed through entanglement or ingestion of non-hazardous solid wastes. Marine turtles and seabirds, in particular, may be at risk from disposed plastics which may cause entanglement or be ingested causing damage to internal tissues. In the worst case, this could be lethal to an affected individual.

The severity of the impact of accidental loss of single items or units overboard of solid waste depends on the type and quantity of waste lost. Controls are in place to prevent accidental release of solid waste overboard or during transport to shore. As a result, any accidental release is not expected to result in significant environmental harm due to expected small volumes/quantities of release and in general high proportion of inert properties.

Overall, the severity of the solid waste discharge with standard industry controls in place is considered to be 'slight' on the Western Gas Risk Matrix given the low volumes of waste generated and the type of waste.

5.8.4 ALARP Demonstration

A summary of the ALARP assessment undertaken for the impacts of solid waste is presented in Table 5-8.

The impact assessment and evaluation has identified a range of existing standard controls for the management of solid waste during offshore petroleum activities that when implemented are considered to manage the impacts from the disposal and management of solid waste on the environment. The generation of solid hazardous and non-hazardous waste is unavoidable. No additional or alternative management procedures have been identified that would reduce the environmental impacts associated with solid waste. On this basis, it is concluded that implementation of the standard controls for management of solid waste including compliance with all MARPOL requirements, which are internationally accepted and implemented across the oil and gas industry, reduces the level of impact to an acceptable level. With no additional controls identified, other than not proceeding with the Activity, it is considered that the impacts of solid wastes have been reduced to ALARP.

Table 5-9: ALARP assessment for solid waste management

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A			
Substitute	N/A			
Engineering	N/A			
Administrate	Manage waste in line with the waste management hierarchy to eliminate, reduce, recycle/reuse and keeping final disposal as least preferred as per Western Gas Waste Management Plan (WG-EHS-PLN-005).	A	Operator established control. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.10.3**
Administrative	Implement Western Gas Waste Management Plan (WG-EHS-PLN-005) to waste generation, storage, transport/transfers and treatment/disposal-the contractor's Waste Management Plan is bridged with the above referred plan.	A	Operator established control. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.10.3**
	Any loss or discharge of hazardous waste materials to the sea will be reported to the AMSA Rescue Coordination Centre (RCC).	A	Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.10.2**
Pollution Control	Waste containers (bins etc.) provided for waste containment are to be clearly marked and suitably covered to prevent material being blown overboard	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.10.1**
	All wastes will be tracked and logged, sent to shore for recycling or disposal at a government approved waste disposal site.	A	Legislative and/or Marine Orders requirement. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 5.10.1**
	Inspections of the waste management containers and storage areas to be done.	A	Control is feasible, standard practice with minimal cost with benefits outweighing any cost sacrifice.	**PS 5.10.1**
	Crew inductions to include requirements for waste management.	A	Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 5.10.4**
Additional Controls				
None identified				

5.8.5 Acceptability

The disposal of hazardous and non-hazardous solid wastes occurs onshore in full accordance with all regulatory requirements. Western Gas has procedures in place for verifying waste management procedures for the storage of wastes onboard the vessel and for onshore disposal by waste removal contractors. The disposal of solid waste to onshore facilities is consistent with industry practice and has been demonstrated to be ALARP. Therefore, the impact associated with solid waste discharge is considered to be environmentally acceptable.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	✓
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	N/A
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

6 RISK ASSESSMENT OF UNPLANNED EVENTS

This Section provides an assessment and evaluation of the potential environmental impacts associated with unplanned events during the activity and details the control measures that will be applied to reduce impacts to ALARP and an acceptable level.

Table 6-1 provides a summary of the unplanned events impact assessment outcomes.

6.1 UNPLANNED EVENTS EXCLUDED FROM THE SCOPE OF THE ENVIRONMENT PLAN

Two unplanned events were considered not to represent a credible source of environmental risk, for the reasons outlined in the following.

Loss of Well Integrity

Loss of well integrity was not considered a credible risk since:

- All wells were plugged and suspended following drilling in accordance with the drilling WOMP and relevant regulations, including installation of primary and secondary barriers in situ to assure isolation of hydrocarbon or water bearing formations and prevent hydrocarbons flowing to surface. Testing to verify the integrity of the installed barriers was conducted following plugging, in accordance with applicable Hess standards (as the titleholder at the time when the wells were suspended), industry good practice and regulatory approvals in force at the time of well construction.
- The adequacy of the measures put in place for well suspension was reviewed against contemporaneous barrier standards and industry good practice in the suspended wells WOMP (EP-AU-SUF-RPT-01045) submitted to NOPSEMA by Hess (as the previous titleholder) in December 2016. Following assessment, NOPSEMA accepted the WOMP in January 2017 and confirmed that it was satisfied the WOMP met the criteria set out in regulation 5.08(c) of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

Given the robust verification of barriers at the time of installation, in line with industry good practice, Hess Standards (as the titleholder at the time when the wells were suspended) and regulatory requirements, which was endorsed/accepted by NOPSEMA, loss of well fluids from the wells was deemed non-credible and not further assessed by the ENVID. The wells will be inspected on at least a five-yearly basis in accordance with the WOMP. In the extremely unlikely event that the inspection provides an indication that any well is not meeting the expectation of no evidence of well fluid releases, Western Gas will respond as per the controls below which have associated performance outcomes, performance standards and measurement criteria.

- Evaluate the associated risk in accordance with Western Gas' Risk Management Standard (WG-HSE-004)
- Notify NOPSEMA
- Develop and implement a management response, including further inspections, remedial action and/or revision to this EP as appropriate.

Confirmation of the well status via the inspections will be evidenced via the ROV inspection logs and included in subsequent performance reporting to NOPSEMA.

Introduction of Marine Invasive Species

The risk of marine invasive species (IMS) being introduced and causing impacts in the Operational Area was not considered to be credible given that:

- The survey vessel will be sourced locally and have been previously working on the North West Shelf.
- There will be no requirement for ballast water exchange onsite during the well head inspections.
- The environmental conditions of the Operational Area (very deep waters, light limiting, low habitat biodiversity) are unfavourable for IMS colonisation.

Consequently, the risk of IMS introduction was not further assessed during the ENVID.

Table 6-1: Summary of risk assessment of unplanned events

Activity		Biological Environment Affected						Socio-Economic Environment Affected				Impact Assessment	
		Whales	Turtles	Fish/ Sharks	Seabirds	Seabed	Marine Biota	Commercial Fisheries	Shipping Activities	Tourism	Greenhouse Gas	Inherent Risk	Residual Risk
Section 6.1	**Diesel Spill from Fuel Tank Rupture**												
	Loss of containment due to vessel collision	✓	-	✓	✓	-	✓	✓	-	-	-	Low	Low
Section 6.2	**Spill of Environmentally Hazardous Chemicals or Refined Oil**												
	Operator error	✓	-	-	-	-	-	-	-	-	-	Low	Low
	Loss of containment-tank overflow	✓	✓	✓	-	-	-	-	-	-	-	Low	Low
	Mechanical failure	✓	-	-	-	-	-	-	-	-	-	Low	Low
	Dropped objects	✓	-	-	-	-	-	-	-	-	-	Low	Low
	Vessel collision	✓	-	-	-	-	-	-	-	-	-	Low	Low
	Structural failure	-	-	-	-	-	-	-	-	-	✓	Low	Low
	ROV failure	-	-	-	-	-	-	-	-	-	✓	Low	Low
Section 6.3	**Interference with Marine Fauna**												
	Vessel movements	✓	✓	-	-	-	-	-	-	-	-	Low	Low
Section 6.4	**Dropped Objects**												
	Dropped objects	-	-	-	-	✓	-	-	-	-	-	Low	Low

6.2 DIESEL SPILL FROM FUEL TANK RUPTURE

During the inspection survey, there is a possibility of a vessel collision occurring between the vessel undertaking the inspection survey and a third party. A vessel collision could occur because of vessel equipment/navigation failure, adverse weather conditions or human error.

Marine diesel oil (MDO) is stored onboard the vessel as a fuel for vessel engines and generators. The rupture of a single fuel tank on a support vessel would require a direct collision from the side of the vessel with enough force to rupture a wing tank. The survey vessel has not been contracted for the Activity, as such, the most credible maximum volume likely to be released from a rupture of a vessel tank is estimated to be in the order of 100 m^3 on the basis that:

- Wing tanks typically hold approximately 100−135 m^3;
- Standard practice is not to fill fuel tanks above 90%; and
- Vessels have the capacity to transfer fuel between tanks, hence further reducing the volume released.

6.2.1 Spill Modelling Results

6.2.1.1 Weathering

The weathering assessment of an instantaneous 100 m^3 surface release of MDO is presented in tabular format at the end of 14 days4 (Table 6-2) and 60 days (Table 6-3), when the mass balance of remaining hydrocarbons falls below 1% of the initial total mass (Table 6-4), and at the occurrence of peak sub-surface hydrocarbon mass (Table 6-5).

Table 6-2: MDO mass balance at the end of day 14

Parameter	Wind Speed		
	5 m s^{-1}	**10 m s^{-1}**	**20 m s^{-1}**
Evaporated (%)	63	61	52
Surface (%)	15	<1	<1
Entrained (%)	9	12	15
Dissolved (%)	<1	<1	<1
Biodegraded (%)	13	27	33
TOTAL (%)	100	100	100

Table 6-3: MDO mass balance at the end of day 60

Parameter	Wind Speed		
	5 m s^{-1}	10 m s^{-1}	20 m s^{-1}
Evaporated (%)	76	63	55
Surface (%)	<1	<1	<1
Entrained (%)	5	5	5
Dissolved (%)	<1	<1	<1
Biodegraded (%)	19	32	39
TOTAL (%)	100	100	100

Table 6-4: MDO mass balance at the point where surface hydrocarbons initially decrease below 1% of the total mass

Parameter	Wind Speed		
	5 m s^{-1}	10 m s^{-1}	20 m s^{-1}
Time	28 days	3 days	10 hours
Evaporated (%)	74	55	26
Surface (%)	1	1	1
Entrained (%)	9	20	47
Dissolved (%)	<1	<1	17
Biodegraded (%)	16	23	10
TOTAL (%)	100	100	100

Table 6-5: MDO mass balance at the point where the percentage of entrained hydrocarbons peak

Parameter	Wind Speed		
	5 m s^{-1}	10 m s^{-1}	20 m s^{-1}
Time	22 days	52 hours	7 hours
Evaporated (%)	71	50	19
Surface (%)	4	6	6
Entrained (%)	10	22	51
Dissolved (%)	<1	5	19
Biodegraded (%)	15	18	6

6.2.1.2 Stochastic Modelling

A summary of the results of the stochastic far-field spill modelling for a 100 m^3 MDO spill in permit area WA-474-P is provided in Table 6-6. Figure 6-1 shows the trajectories of a 100 m^3 diesel spill occurring in the permit area and the worst-case AMBA based on a diesel spill anywhere within the permit areas.

Table 6-6: Summary results of stochastic far-field modelling for a 100 m^3 MDO spill in permit areas WA-474-P and WA-70-R.

Parameter	Results
Surface Hydrocarbons >10 g/m^2	
Distance predicted to travel from release site	Up to ~60 km
Geographical Features	No contact
Key Ecological Feature	No contact as KEF submerged
Marine Park	Contact
Hydrocarbons Ashore >0 g/m^2	
Shorelines	No contact
Geographical Features	No contact
Key Ecological Feature	No contact
Marine Park	No contact
Total Hydrocarbons >500 ppb	
Distance predicted to travel from release site	No total hydrocarbons in the water column above threshold predicted to occur
Geographical Features	No contact
Key Ecological Feature	No contact
Marine Park	No contact
Dissolved Hydrocarbons >100 ppb	
Distance predicted to travel from release site	No dissolved hydrocarbons in the water column above threshold predicted to occur
Geographical Features	No contact
Key Ecological Feature	No contact
Marine Park	No contact

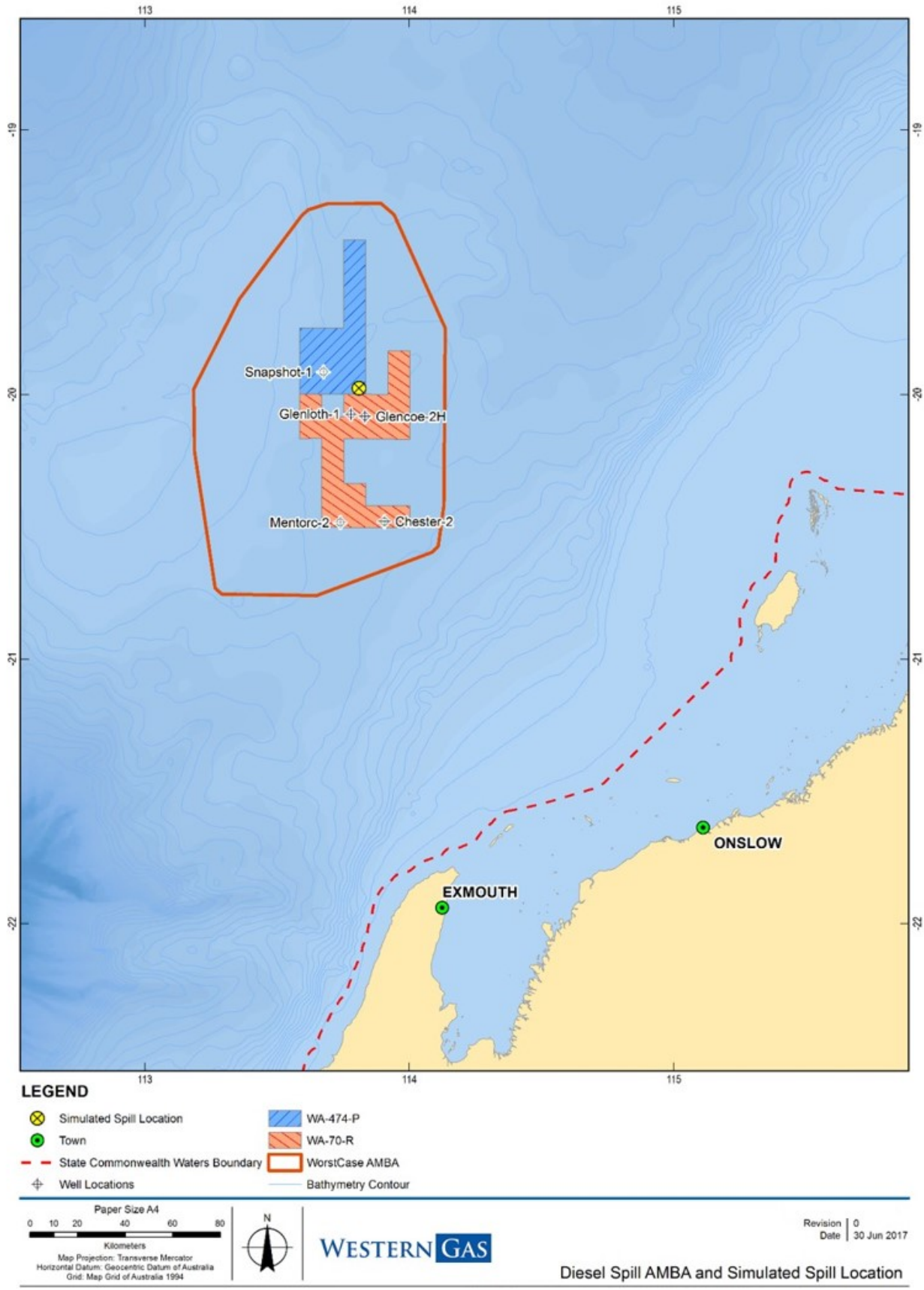

Figure 6-1: AMBA for a surface release of 100 m^3 MDO within permit areas WA-474-P and WA-70-R

6.2.2 Potential Impacts

The known and potential environmental impacts from a diesel spill from a vessel collision include a temporary decline in water quality and toxicity effects to marine flora and fauna. The severity of the impact is dependent on the sensitivity of the receptor (Table 6-7).

The potential for environmental impacts of diesel spills is related primarily to the acute toxicity of the dissolved aromatic hydrocarbon compounds. Potential impacts of a hydrocarbon spill include the physical and chemical alteration of natural habitats, the physical smothering effects on flora and fauna, direct toxic effects and physiological effect on flora and fauna and alteration to biological communities because of the effects on key organisms (AMSA, 2002[36]). There is also some potential for impacts to marine fauna associated with ingestion of spilled hydrocarbons, dermal contact with the diesel spill and inhalation of hydrocarbon vapours by species that surface to breathe close to the water surface (NOAA, 2013[37]).

Table 6-7: Impact assessment summary – 100 m^3 MDO spill

Environmental Receptors	Impact Description
Marine Fauna	
Cetaceans	Whales and dolphins spend a significant time at the sea surface in search of food and to breathe as such if they are in the vicinity of the spill location, they are likely to come into contact with the spill. However, as they are smooth skinned, hairless mammals, so diesel tends not to adhere to their skin, limiting the potential impacts of oiling. Whales and dolphins will be susceptible to impacts through ingestions and from inhalation of vapour and fumes. Their susceptibility varies among species, for example baleen whales that skim surface waters and the water column (e.g. southern right whales) are more likely to be affected by surface oil than those baleen whales that 'gulp' feed such as the humpback whale; toothed whales are also less susceptible owing to this same type of feeding behaviour (Geraci and St. Aubin, 1985[38]). Cetaceans are not predicted to be impacted by entrained hydrocarbons since they are mobile species and not likely to be constantly exposed for extended durations that would be required to cause any major toxic effects. Given the size of the spill and expected rapid evaporation and dispersion rate, impacts to marine mammals are expected to be low.
Seabirds	Seabirds will have a high risk of contact with diesel spills as they spend time on or near the sea surface whilst resting and feeding. Oil-coated birds can suffer from hypothermia, dehydration, skin irritation, drowning and starvation. Internal effects from either direct ingestion during preening or ingestion of contaminated food prey can lead to intestinal damage and reproduction effects.

36 AMSA (2002) The Effects of Maritime Oil Spills on Wildlife including Non-Avian Marine Life. Australian Maritime Safety Authority. http://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/General-Information/oiled-wildlife/marine-life/index.asp.

37 NOAA. (2013). Shoreline Assessment Manual. 4th Edition. U.S. Dept. of Commerce. Seattle, WA: Emergency Response Division, Office of Response and Restoration, National Oceanic and Atmospheric Administration. 73 pp + appendices. Available to download http://www.shorelinescat.com/Documents/Manuals/NOAA%20Shoreline%20Assessment%20Manual.pdf. Accessed November 2014.

38 Op cit **Error! Bookmark not defined.**.

Environmental Receptors	Impact Description
Marine Reptiles	Marine turtles may be exposed to surface and water column hydrocarbons through direct contact resulting in eye/skin damage, ingestion, consumption of contaminated prey items and inhalation of diesel vapour. Ingestion can subsequently lead to physiological effects including internal organ damage. Given the volume of diesel, the high evaporation rates and dispersion predicted and distance from significant turtle habitat (Barrow Island ~180 km (97 nm) from the permit areas), the impacts to marine turtles are expected to be restricted to low.
Fish (including sharks and commercial/ recreational species)	Pelagic fish which spend their time in the upper water column will be at greatest risk of impact from entrained and surface diesel. Pelagic fish are highly mobile and species likely to be found in the permit area are predatory species including tuna, billfish, mackerel and shark. Fish near the sea surface are thought to be are able to detect and avoid contact with surface slicks and mortalities rarely occur in the event of a hydrocarbon spill in open waters (Kennish, 1997[39]; Scholz *et al*., 1992[40]). Those fish that do come into contact with surface or entrained oil will be affected by smothering through coating of gill structures leading to suffocation or through ingestion, leading to infection and internal organ or tissue damage. The impacts of fish eggs, larvae and juveniles which live a planktonic existence are described below.
Plankton	The effects on plankton will be highly localised and confined to plankton entrained within the diesel spill, this will typically be phytoplankton, eggs, larvae and pelagic invertebrates. Fish eggs, larvae and juveniles which live a planktonic existence are more sensitive to oil (particularly dissolved and entrained oil within the water column). Although contact or exposure to low concentrations of dissolved oil is predicted, losses are expected to be of little consequence compared to significantly larger natural losses through predation. Due to the volumes of diesel involved and the offshore location, no effects on plankton in the region is predicted and no discernable effect is predicted on the size or health of future adult populations.
Marine Habitats	
No impacts are predicted to occur to: • Shoreline habitats (mangroves; sandy beaches; intertidal sediments; rocky shores; intertidal reefs); or • Subtidal habitats (coral reefs; seagrass beds; benthic sediments).	
Marine Protected Areas	
Gascoyne CMP	Conservation values that could be potentially impacted are discussed previously in this table: • Marine reptiles: foraging area for hawksbill and flatback turtles; • Fish and sharks: important foraging areas for whale sharks; and • Birds: foraging areas for migratory seabirds.
No impacts are predicted to occur to: • Other Commonwealth Marine Parks; • State Marine Parks or State Marine Management Areas; • Key Ecological Features; or • World/National Heritage Sites, or other heritage values.	

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40 Op cit **Error! Bookmark not defined.**.

Environmental Receptors	Impact Description
Socio-Economic Receptors	
Commercial Fisheries	Several commercial fisheries may operate within the worst-case AMBA. Potential impacts to these fisheries range from disruption of fishing activities due to the presence of the spill and a tainting of fish. Due to the evaporative nature of diesel, the impact to commercial fisheries is expected to be low.
Tourism and Recreational Fishing	Impacts to tourism and recreational fishing are not predicted due to the distance of the spill from the coast.
Shipping	Shipping operations are not predicted to be affected by a marine diesel spill.
Offshore Petroleum Activities	Offshore petroleum activities are not predicted to be affected by a marine diesel spill.
Heritage	No impacts are predicted to occur to cultural and natural heritage sites/locations (i.e. World Heritage sites, Commonwealth Heritage sites; National Heritage sites; Register of National Estate sites; Indigenous heritage sites; shipwrecks) from diesel spills due to fuel tank rupture incidents.

6.2.3 ALARP Demonstration

Table 6-8: ALARP assessment for diesel spill from a fuel tank rupture

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A		Vessel presence is required in the operational area to proceed with the Activity.	
Substitute	N/A		Vessel presence is required in the operational area to proceed with the Activity.	
Engineer	Vessels equipped with navigation aids and communication equipment compliant with navigational requirements of Navigation Act 2012, SOLAS; AMSA; and Marine Orders 21 and 30.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.1**
Separate	N/A			
	N/A			
Administrate	Crew undertaking vessel bridge watch qualified in accordance with International Convention of STCW95, AMSA Marine Order –	A	Control based on legislative requirements must be accepted. Control is feasible, standard	**PS 6.2.1**

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
	Part 3: Seagoing Qualifications or certified training equivalent.		practice with benefits outweighing any cost sacrifice.	
	Bridge-watch is maintained on all vessel 24-hours per day.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.1**
	Notification of survey location, duration of activities, etc. to AMSA RCC and AHS who issue a 'Notice to Mariners' prior to commencement of the Activity.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.2**
	Relevant stakeholders consulted/advised of survey activities prior to commencement of the survey.	A	Control based on Western Gas requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.3**
Pollution Control	Implement and maintain vessel MARPOL-compliant SOPEP.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.4**
	Develop and maintain Western Gas WA-474-P, WA-70-R Suspended Wells OPEP (WG-EHS-PLN-002).	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.2.5**
Additional Controls				
None identified.				

6.2.3.1 ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of vessel collision during the survey. Without bulk storage of MDO onboard the vessels sufficient for the survey campaign (3 days), the Activity would take substantially longer with frequent bunkering activities, or a supply vessel would have to sail out and bunkering would have to occur at sea. Both of these alternative options would increase the risk of vessel collision and risk of spills to the marine environment.

All vessels are equipped with navigational aids and safety equipment as required under the *Navigation Act 2012* and other relevant standards. With the implementation of standard and appropriate control measures and with no other additional controls or alternatives available that would offer a net

environmental benefit, it is considered that the risk of loss of MDO due to vessel collision is reduced to ALARP.

6.2.4 Acceptability

The likelihood of a vessel collision occurring and resulting in the loss of bulk storage MDO is rare with all practicable control measures in place to prevent collisions. Control measures are consistent with legislative codes, standards and procedures, and good oil field practice which include *Navigation Act 2012*, SOLAS 1974, AMSA Marine Orders Part 3, 21 and 30 in relation to safety of navigation and emergency procedures, prevention of collisions and seagoing qualifications.

In the event of a spill occurring, significant impacts are not predicted due to the volumes of MDO on the vessel and the controls in place to manage spill events (SOPEP and OPEP). Vessels also have capability to divert fuel to an alternative tank in the event of a ruptured tank; although this activity would be dependent on health and safety considerations at the time of the spill.

Given the low risk of a vessel collision, the control measures for the prevention of collisions and to respond in the event of a spill (that are consistent with legislative codes, standards, good oilfield practice and Western Gas' policies), and that no reasonably practicable alternative controls have been identified that would provide significant net environmental benefit, Western Gas consider the risk of vessel collision and associated impact from the loss of MDO to the marine environment to be an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	N/A
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable) or 'Low' (Acceptable) on the Western Gas Risk Matrix.	✓
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, stakeholders' expectations and Western Gas corporate policies.	✓

6.3 SPILLS OF ENVIRONMENTALLY HAZARDOUS CHEMICALS OR REFINED OIL

Various hydrocarbons and environmentally hazardous chemicals/liquids are stored onboard the vessel for use during the survey. Such liquids include fuel, biocides, corrosion inhibitors, refined oil, lube oil, hydraulic oil, lubricating oils, cleaning and cooling agents, glycol and methanol, and stored or spent chemicals.

Accidental loss of these liquids or liquid wastes to the marine environment could occur as a result of spillage during handling, inadequate bunding and/or storage, inadequate method of securing or container/tank/pipework failure, leak from equipment and/or rupture or failure of ROV hydraulic hoses whilst underwater.

The Oil Spill Risk Database (OSRD) model presented within the AMSA assessment of offshore hydrocarbon spills (DNV, 2011[41]) provided a historical spill frequency of quantities greater than 1 tonne due to storage of diesel or refined oil to be in the order of 3.4×10^{-3} per facility per year.

During ROV operations, the largest credible volume of a subsea leak of hydraulic fluid due to ROV equipment failure or damage is 30 L. During the survey, the volume of spill that could be accidentally released to the marine environment is likely to be small and limited to the volume of individual storage containers (e.g. IBC, fuel drums etc.) stored onboard the vessel deck or storage rooms.

The maximum potential release volume from a single spill or leak event of hydraulic fluid would be limited to the volume of containers, tanks, hoses and pipework. The most credible worst-case shipboard hydraulic fluid spill that could enter the marine environment would be in the region of 160 L (1 bbl) of hydraulic fluid from an on-deck hydraulic hose or container.

6.3.1 Potential Impacts

The accidental discharge of chemicals or refined oil has the potential to cause localised toxic effects on marine fauna (pelagic fish, cetaceans, marine mammals and marine reptiles) and flora (phytoplankton) and a localised reduction in water quality. The potential impacts from a surface spill would most likely be highly localised and restricted to the immediate area in the footprint of the spill in the surface waters and upper layers of the water column. In the event of a leak from a deployed ROV, a reduction in water quality would be confined to the immediate area. There are no emergent habitats within the Operational Area and benthic habitats would not be impacted owing to the water depth (900−1,200 m).

In the unlikely event of a chemical/refined oil spill, any pelagic fish, cetaceans, marine mammals and marine reptiles will be able to move out of the spill area and any accidental spills would therefore unlikely result in any fatal impacts to these marine fauna. Phytoplankton entrained in the spill plume will be impacted, however, due to the small spill volumes, and rapid dilution and dispersal by prevailing offshore currents, the environmental effects will be temporary and highly localised, with no significant impacts expected owing to the short exposure timeframe to the spill.

41 Det Norske Veritas (DNV). (2011). Final Report Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters. Report for Australian Maritime Safety Authority, Report No PP002916 Rev 5, 14 December 2011. Accessed October 2014 from http://www.amsa.gov.au/forms-and-publications/environment/publications/Other-Reports/index.asp

6.3.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for the risks and impacts associated with spills of environmentally hazardous chemicals or refined oil is presented in Table 6-14. This process was completed as outlined in Section 4.2.1 and includes all existing standard industry and legislative controls, consideration of additional controls, and acceptance or justification if controls were considered not to be practicable. The result of this ALARP assessment contributes to the overall acceptability of the risks and impacts.

Table 6-9: ALARP Assessment for accidental hazardous chemical and hydrocarbon spills

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Substitute	N/A			
Engineer	N/A			
Separate	All vessel machinery space oily water exceeding 15 ppm must be contained and disposed of at a licensed onshore reception facility or transferred to a carrier licensed to receive waste.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.1**
Administrate	Liquids from drains may only be discharged if the oil-in-water content does not exceed 15 ppm after treatment in a MARPOL-compliant oily water filter system.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.1**
	Current International Oil Pollution Prevention (IOPP) certificate for oily water filter system.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.2**
	Fuels, oils and hazardous chemicals must be stored with secondary containment.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.3**
	Continuous bunding or drip trays used around machinery or equipment with the potential to leak chemicals/ fuel.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweigh any cost sacrifice.	**PS 6.4.5**
	Critical hoses outside bunded areas are identified and regularly inspected/ maintained/ replaced as part of the Preventative Maintenance System.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.4**
	Scupper plugs or equivalent deck drainage control measures available	A	Control based on legislative requirements must be accepted.	**PS 6.4.5**

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
	where hazardous chemicals and hydrocarbons are stored and frequently handled.		Control is feasible, standard practice with benefits outweighing any cost sacrifice.	
	Vessels will have current MARPOL-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP – for noxious liquid) – the latter may be combined with a SOPEP.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.5**
	All shipboard hazardous liquid, chemical and hydrocarbons spills will be managed in accordance with the SOPEP/SMPEP.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.5**
	Spill clean-up equipment is located where hazardous chemicals and hydrocarbons are frequently handled.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.5**
	Any loss or discharge to sea of harmful materials to be reported to the AMSA Rescue Coordination Centre (RCC).	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.6**
	Hazardous waste materials (including empty packaging previously containing hazardous substances and contaminated material from spill response activities) are contained onboard for onshore disposal at a licensed reception facility or transferred to a carrier licensed to receive waste.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.7**
	Where Offshore Chemical Notification Scheme (OCNS) rating of D or E or a CHARM rating of Silver or Gold rated chemicals are used, no further control required.	A	Control based on Western Gas requirements must be accepted. Control is feasible, standard practice with benefits outweigh any cost sacrifice.	**PS 6.4.8**
	If other non-rated chemicals are required, chemical selection procedures described in the Western Gas Chemical Risk Assessment Procedure (WG-EHS-PRO-001) will be followed.	A	Control based on Western Gas requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.4.8**
Pollution Control	N/A as covered above.			
Additional Controls				

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Eliminate	Eliminate and/ or minimise chemical and hazardous material inventories.	R	The elimination of the use of chemical products and hydrocarbons is not possible. The type and quantity of hazardous materials onboard the vessel will be optimised for the survey.	

6.3.2.1 ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of a release of hazardous chemicals and hydrocarbons into the marine environment during the survey. Hazardous chemicals and liquids containing hydrocarbons are required to undertake the inspection survey and their elimination is not a viable option. No additional or alternative controls were identified that could further reduce the risk and impact of spill. The extensive mitigation and management controls outlined are therefore considered to reduce the risk to ALARP.

6.3.3 Acceptability

The proposed management controls for preventing and minimising the risk of accidental spills of hazardous chemicals and hydrocarbons occurring are comprehensive and consistent with all relevant legislation and standards and good oil field practice. These controls include ensuring that the chemicals used pose the lowest risk possible to the environment through the implementation of Western Gas' Chemical Risk Assessment Procedure (WG-EHS-PRO-001) for the selection of chemicals will minimise subsequent impacts in the event of an accidental release.

The magnitude of the worst-case spill is unlikely to be greater than 160 L (1 bbl), the size of the largest storage container, and more likely to be less than 80 L (0.5 bbl drum size). A release of this size would be highly localised and the offshore location of the wells is such that any spills would be rapidly diluted and dispersed with currents such that the decline in water quality and any environmental impacts would be temporary. As such significant impacts are not expected due to the short exposure timeframe.

With no additional or alternative controls identified, the risk and impact of spill to the marine environment is considered to be acceptable.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	N/A
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable) or 'Low' (Acceptable) on the Western Gas Risk Matrix.	✓
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

6.4 INTERFERENCE WITH MARINE FAUNA

The physical presence and movements of the vessel have the potential to impact with marine fauna during the survey. Marine mammals are susceptible to injury or mortality resulting from interactions with vessels, particularly then they rise to the surface to breathe, rest or forage in surface waters. The impact may range from behavioural changes resulting from the presence/movement of the vessel to severe impacts such as serious injury or mortality resulting from vessel strikes with large, slow-moving cetaceans, marine turtles or whale sharks. Behavioural avoidance during the survey may also be caused by the generation of underwater noise (discussed in previous Section 5.5).

The extent of the area affected will be restricted to that around the vessel whilst in the Operational Area. Within the Operational Area, the vessel will be stationary or moving at slow speeds.

The Activity is expected to take a total of 72 hours (3 days) with an estimated 6 hours at each well head.

6.4.1 Potential Impacts

6.4.1.1 Potential Impacts to Cetaceans

Collisions between vessels and cetaceans are most frequent on continental shelves where high vessel traffic and cetacean habitat occurs (WDCS, 2006[42]). Many more cases go unrecorded simply because large ships do not notice they have hit anything. Vessels collisions can result in death, serious harm from blunt trauma injuries, including fractured bones and hemorrhaging, or propeller lacerations, sometimes with mortality occurring several years after the collision if infection has occurred.

Most whales show distinct avoidance behaviour to vessels with changes in surfacing patterns, swimming speed, duration underwater as well as horizontal and vertical changes in swimming direction

[42] WDCS (2006). Vessel collisions and cetaceans: what happens when they don't miss the boat. Whale and Dolphin Society. A WDCS Science Report by Dolman, S., William-Grey, V, Asmutis-Silvia, R. and Isaac, S.

(Richardson *et al*., 1995[43]; WDCS, 2006[44]). WDCS (2006)[45] also indicates that some cetacean species, such as humpback whales, will detect and change course to avoid a moving vessel. In general it is thought that cetacean calves and juveniles have a higher risk of impact mostly likely due to less frequent and shorter dives (Szabo and Duffus, 2007[46]).

The likelihood of vessel-whale collision being lethal is greatly influenced by vessel speed and vessel size. The risk of a collision causing mortality of the whale increases as the vessel speed increases (Conn and Silber, 2013[47]; Jensen and Silber, 2003[48]).

6.4.1.2 Potential Impacts to Whale Sharks

Whale sharks spend a significant amount of time at or close to the sea surface (Norman, 1999[49]) and therefore may be more vulnerable to vessel strike. Scars have been observed on whale sharks considered likely to have been caused by contact with vessels and there have been several reports of whale sharks being struck by bows of larger ships (Norman, 1999[50]).

6.4.1.3 Potential Impacts to Marine Turtles

Vessel strike is recognised as an important threat to vulnerable and endangered sea turtles in Australia. Vessel strikes involving contact with propellers would be lethal at almost all speeds. Studies have shown that turtles are less likely to flee from a fast moving vessel than from a slow moving vessel, presumably related to habituation to vessel sounds as background noise and poor visual senses (Hazel *et al*., 2007[51]).

Considering the vessels are stationary for the majority of the time at each well site, the risk of vessel collision with marine fauna is extremely low and it is unlikely that additional vessel traffic in the area will have a significant impact on migratory fauna species or other transiting marine fauna that may be present. Slow vessel speeds, in combination with the generation of vessel noise, is likely to elicit avoidance behavior of cetaceans from the immediate vicinity of the Operational Area. In the highly

43 Richardson, W.J., Greene, C.R. Jr., Malme, C.I. & Thomson, D.H. (1995). Marine mammals and noise. Academic Press, New York. 576 pp.
44 Op cit 42.
45 Op cit 42.
46 Szabo, A.R. and Duffus, D. (2007). Mother-offspring association in the humpback whale (*Megaptera novaeangliae*): Following behaviour in an aquatic mammal. Animal Behaviour, 75: 1085-1092.
47 Conn, P.B & Silber, G.K. (2013). Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. Ecosphere, 4(4): 43.
48 Jensen, A.S. and Silber, G.K. (2003). Large whale ship strike database. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Technical Memorandum NMFS-OPR. 37 pp.
49 Norman, B.M. (1999). Aspects of the biology and ecotourism industry of the Whale Shark *Rhincodon typus* in north-western Australia. MPhil. Thesis, Murdoch University, Western Australia.
50 Ibid.
51 Hazel, J., Lawler, I.R., Marsh, H. & Robson, S. (2007). Vessel speed increases collision risk for the green turtle *Chelonia mydas*. Endangered Species Research, 3: 105-113.

unlikely event of a cetacean, whale shark or turtle mortality, the effect is not likely to be significant (as defined by the EPBC Act Significant Impact Guidelines (DoE, 2013[52]) at the population level.

6.4.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for the risks and impacts associated with the interference with marine fauna is presented in Table 6-15. This process was completed as outlined in Section 4.2.1 and includes existing standard industry and legislative controls, consideration of additional controls, and acceptance or justification if controls were considered not to be practicable. The result of this ALARP assessment contributes to the overall acceptability of the risks and impacts.

Table 6-10: ALARP assessment for interference with marine fauna

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	N/A			
Administrate	Vessel Master to operate vessel in accordance with Part 8 Division 8.1 (r8.04) of the EPBC Regulations 2000.	A	Control based on legislative requirements must be accepted. Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.5.1**
	Environmental awareness briefing to marine crew prior to activities that includes marine fauna interaction requirements.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.5.2**
	Sightings of cetaceans, whale sharks and marine turtles are recorded and reported.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.5.3**
Pollution Control	N/A			
Additional Controls				
Separate	Prevent or reduce use of vessels during peak migration periods.	R	Vessel based inspections are an essential requirement of the Activity. The very short duration	

52 DoE (2013). Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999. Matters of National Environmental Significance. Commonwealth Agencies. Department of the Environment. Commonwealth of Australia.

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
			of the inspection activity and stationary/slow nature of vessel operations makes the risk of impact extremely low. Restricting scheduling options could complicate logistic arrangements and affect the availability/cost of a suitable vessel, particularly given the desire to source a vessel operating locally, for negligible environmental benefit.	

6.4.2.1 ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of interference with marine fauna during the survey. The presence and movement of the vessel are critical to the Activity and cannot be eliminated if it is to proceed.

Restricting the timing of the survey to avoid peak marine fauna migration periods would raise logistical complications in coordinating survey (ROV) and vessel contractors, potentially affect the availability and/or costs of a suitable vessel (given the desire to utilize a locally based vessel for biosecurity reasons) and increase exposure to delays associated with cyclone season. Considering the very low level of risk due to the nature and duration of the inspection activities, the cost of this option was considered to be disproportionate to any environmental benefit. With no reasonable additional controls identified, other than not proceeding with the inspection survey, it is considered that the risk of interference/collision with marine fauna during the survey has been reduced to ALARP.

6.4.3 Acceptability

As the potential impact from the Activity is localised, temporary and transient, all reasonable means to minimise risk of vessel collisions, interactions and disturbance with marine fauna due to vessel movements have been taken. In the Operational Area, the vessel will mostly be stationary, further reducing the likelihood of vessel strike. Vessel speed in the vicinity of observed cetaceans is managed in accordance with Part 8 of the EPBC Regulations 2000. Marine crew attend an environmental awareness briefing that includes marine fauna interaction requirements. The activity is typical of offshore activities undertaken elsewhere and in Australian waters and the proposed management control for protection of whales is consistent with regulatory requirements imposed on the whale watching industry and best practice for managing interactions with whales.

No other reasonably practicable alternative control measures have been identified that would provide a net environmental benefit. Western Gas, therefore consider the proposed control measures are

considered effective in reducing the risk and consequence of vessel interference/collision with marine fauna to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	N/A
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable) or 'Low' (Acceptable) on the Western Gas Risk Matrix.	✓
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

6.5 DROPPED OBJECTS

Seabed disturbance can result from the accidental release of an object overboard from the vessel during the survey. Dropped objects can occur (albeit highly unlikely) through unfastening of objects on the vessel deck or through any lifting operation onboard the vessel.

The direct impact to the seabed from a dropped object would be restricted to within the Operational Area. Planned events resulting in seabed disturbance are discussed in previous Section 5.4.

6.5.1 Potential Impacts

In the event of a dropped object overboard there would be localised disturbance to the seabed, potentially resulting in the loss of or change in benthic habitat and associated communities. Potential impacts to the seabed benthos would be restricted to that which lies in the immediate footprint of the dropped object. The area of the seabed potentially affected is estimated to be less than 10 m^2. The severity of the impact to benthic communities/habitat will be dependent on the density of biota, the sensitivity of biota to the disturbance and the recovery potential of the benthic communities affected by the dropped object.

The permit area lies within the Exmouth Plateau of the Carnarvon Basin. The sediments on the Exmouth Plateau are primarily muddy sand and sandy mud (Baker *et al*., 2008[53]). Seabed surveys undertaken in Permit Area WA-390-P (which WA-70-R falls within) reported the seabed typically consists of a homogenous substrate of biogenic calcareous ooze typical of similar habitats found at these depths throughout the NWS region, with habitat and assemblages well represented in the region and of low

[53] Baker, C., Potter, A., Tran, M. & Heap, A.D. (2008). Geomorphology and sedimentology of the Northwest Marine Region of Australia. Geoscience Australia, Record 2008/07. Geoscience Australia, Canberra. http://www.environment.gov.au/system/files/resources/d9391818-9d75-4651-9f43-0f4f32415153/files/nw-geomorphology.pdf. Accessed October 2014.

conservation value (RPS, 2012[54]). No rare, endangered, isolated species or habitats of significance were present within the permit area. The soft sediments were found to contain infauna and macro-invertebrates typical of the habitats in these depths on the NWS (RPS, 2012[55]).

The fauna typically have a low sensitivity to physical disturbance compared to, for example, sessile epifaunal filter feeders such as sponges or octocorals, and generally display high fecundity rates and recovery rates following physical disturbance. Recovery would occur within weeks by recruitment by planktonic larvae but is most likely to occur through the migration of adults into disturbed areas, either by active migration or passive transport from adjacent undisturbed areas (Savidge and Taghon, 1988[56]).

The Exmouth Plateau Key Ecological Feature (KEF) overlaps with the permit areas. The Exmouth Plateau KEF is a regionally and nationally unique deep-sea plateau that may modify the flow of deep waters, generating internal tides and may contribute to upwelling of nutrients, thus serving an important ecological role. Given the extent of the potential seabed disturbance (10 m^2) in relation to the Exmouth Plateau (~5,000 km^2) (Baker *et al*., 2008[57]) and recovery by active recruitment occurring within weeks, the impact is considered to be minor.

Overall, the likelihood of dropped objects occurring is considered ‘unlikely’ and the severity of the impact is ‘slight’. As such, the unmitigated risk with standard controls in place is assessed as ‘low’.

6.5.2 ALARP Demonstration

A summary of the ALARP assessment undertaken for the risks and impacts associated with dropped object is presented in Table 6-16. This process was completed as outlined in Section 4.2.1 and included consideration of existing standard industry controls, consideration of additional controls, and acceptance or justification if controls were considered not to be practicable. The result of this ALARP assessment contributes to the overall acceptability of the risks and impacts.

54 Op cit 12.
55 Op cit 12.
56 Savidge, W.B. and Taghon, G.L. (1988). Passive and active components of colonization following two types of disturbance on intertidal sandflat. Journal of Exp. Mar. Bio. Ecol., 115: 137-155.
57 Op cit 53.

Table 6-11: ALARP assessment for dropped objects

Hierarchy	Controls	Accept/ Reject	Justification	Reference to Performance Standard
Existing Controls				
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	N/A			
Administrate	All lifts to be completed in accordance with the Contractor procedures.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.6.1**
	All lifting equipment will be certified, is regularly inspected/ maintained and will be used by crew trained in task required.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.6.2**
	Records of any equipment lost overboard completed.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.6.3**
	Recovery of dropped objects where practicable and safe to do so.	A	Control is feasible, standard practice with benefits outweighing any cost sacrifice.	**PS 6.6.3**
Pollution Control	N/A			
Additional Controls				
None identified.				

6.5.2.1 ALARP Summary

Lifting operations may be required onboard the vessel, other than safe handling procedures, no other management controls are considered necessary for the prevention of objects being dropped. Given the minor effects of seabed disturbance due to the lack of sensitive seabed features in the permit areas, the predicted rapid recovery of the benthic environment following disturbance and the unlikely occurrence of any dropped objects, the risk and impact of dropped objects is considered to be ALARP.

6.5.3 Acceptability

Lifting activities will be performed as per standard contractor procedures in place for the specific activity which are standard procedures typical during offshore petroleum exploration operations elsewhere and

in Australia. Through the implementation of the proposed management controls, the risk of any objects being accidentally dropped overboard is reduced to a level that is considered acceptable.

The impact resulting from dropped objects will be localised and temporary. No other reasonably practicable alternative control measures have been identified. Western Gas therefore considers the proposed control measures to be effective in reducing the risk and consequence of dropped objects to an acceptable level.

Acceptability Statement Summary		
Consideration	**Acceptability Statement**	**Acceptability**
Planned Events	The severity of the residual environmental impact assessed as reduced to 'Minor Effect' or 'Slight Effect' on the Western Gas Risk Matrix.	N/A
Unplanned Events	The residual environmental risk assessed as reduced to 'Medium' (Tolerable), or 'Low' (Acceptable) on the Western Gas Risk Matrix.	✓
Internal/ External Context	The activity (and associated potential impacts and risks) is consistent with relevant legislation, standards/guidelines, offshore practice or benchmarking, activity-specific standards and procedures, and Western Gas corporate policies.	✓

7 HYDROCARBON POLLUTION EMERGENCY RESPONSE

Western Gas has prepared the Western Gas WA-474-P, WA-70-R Suspended Wells Oil Pollution Emergency Plan (WG-EHS-PLN-002). The OPEP is the primary reference document and key control measure to be implemented in the event of an oil spill during the survey and has been developed as a formal means of establishing the processes and procedures to ensure that Western Gas maintains a constant vigilance and readiness to prevent and, where required, respond to and effectively manage oil spill incidents that may occur during the survey.

7.1 SOURCE OF RISK

This EP has identified all credible and worst-case hydrocarbon spill scenarios as:

- Tier 2: Unplanned diesel spill from a vessel collision resulting in a ruptured fuel tank of 100 m^3 (629 bbl) (refer to Section 6.2).
- Tier 1: Unplanned spill onboard of 160 litres/0.16 m^3/1 bbl (refer to Section 6.2).

7.2 OIL SPILL REPSONSE STRATEGIES

The selected spill response strategies applicable for the Activity (Table 7.1) were based on the preliminary NEBA and ALARP justification for each strategy, which are:

- Primary responses
    - Source Control – Vessel Deck Spills (Tier 1) and Vessel Tank Rupture Spill (Tier 2)
    - Monitor and Evaluate (Operational Monitoring) (All Tiers)
    - Scientific Monitoring (Tier 2)
- Secondary responses
    - Mechanical Dispersion (Tier 2)

Table 7.1: Summary of applicability of oil spill response strategies

Response strategy	Tier 1 Oil	Tier 2 MDO
Source control	✔	✔
Monitor & evaluate	✔	✔
Scientific Monitoring	Not required	✔
Oiled wildlife response	Not required	Not suitable
Mechanical dispersion	Not required	✔
Shoreline clean-up	Not required	Not required
Shoreline protection and deflection	Not suitable	Not suitable
Dispersant application	Not suitable	Not suitable
Offshore containment & recovery	Not required	Not required
In-situ burning	Not suitable	Not suitable

7.2.1 Source Control – Hydrocarbon Spills (Tier 1)

In the event of a Tier 1 spill onboard the vessel, source control will be managed by isolating hoses or turning off pumps where applicable and the spillage should be contained within a bunded area. The spill will then be cleaned-up with absorbent materials which are then contained for appropriate disposal.

7.2.2 Source Control – Vessel Tank Rupture Spill (Tier 2)

If a vessel tank rupture occurs, then the following activities will be implemented to reduce impacts and to control the source of the spill:

- Reduction of the head (pressure) of liquid in the damaged fuel tank by dropping or pumping the tank contents into an alternative tank with spare capacity.
- Consideration of pumping water into the damaged tank to create a water layer that will serve as a barrier between the fuel and the marine environment.
- Consideration of transferring fuel from the leaking tank to another vessel(s).
- Consideration of adjusting the trim of the vessel to reduce fuel flow out of the ruptured tank.

Through immediate implementation of any of these controls a reduction (or cessation) the volume of hydrocarbons released to the marine environment will be immediately realised. Several factors may result in delays or failures to implement these control measures (e.g. inclement metocean conditions, large rupture, personnel injuries) resulting in complete loss of diesel from a fuel tank compartment into the marine environment (~100 m^3 or 629 bbl).

7.2.3 Monitor and Evaluate (All Tiers)

Monitoring and evaluation of the spill will commence immediately with the Activity's resources (survey vessel). The aim of this strategy is to maintain situational awareness, to inform the Incident Management Team (IMT) to plan responses and to assess the effectiveness of response strategies. Monitor and evaluate tasks will include:

- Visual observation from the vessel
- Visual observation from aircraft (fixed wing or helicopter)
- Oil spill trajectory modelling forecasts
- Visual observation from vessels of opportunity if in the area and/or Western Gas contracted vessels
- Satellite tracking buoys
- Satellite imagery

Direct observations will be undertaken from the vessel and aircraft to monitor the distribution of surface oil. Initial observations will be undertaken by the survey vessel at the incident area. Tracking buoys will

be deployed to monitor the movement of the surface slick and verify and assist with oil spill trajectory modelling. Modelling will be commenced to predict the likely behaviour of the surface oil slick and inform response planning and may be supplemented by satellite imagery. Marine fauna (oiled and non-oiled) observations will be recorded.

7.2.4 Mechanical Dispersion

Mechanical dispersion is undertaken by driving vessels through slicks to enhance dispersion of surface oils thereby enhancing the natural degradation process. The 'prop-wash' speeds up the dispersion process. Driving vessels through diesel (where safe to do so) can aid in the entrainment and subsequent degradation of hydrocarbons.

7.2.5 Scientific Monitoring

Scientific monitoring will be undertaken in the event of a Tier 2 spill incident to quantify the nature of the short- and long-term environmental impacts and subsequent recovery of the environmental sensitivities. During the incident scientific monitoring will also inform the effectiveness of the oil spill response in protecting the environment. The following scientific monitoring studies will be undertaken in the event of an unplanned hydrocarbon release incident:

- S1: Marine Waters
- S2: Hydrocarbons in Representative Commercial and Recreational Fish

7.3 POTENTIAL IMPACTS OF SPILL RESPONSE OPERATIONS

If response activities are required, poorly planned or executed responses can result in:

- Disturbance to marine fauna and flora from increased vessel, aircraft and/or helicopter operations.
- Spreading of hydrocarbons further beyond the zone of contamination (e.g. secondary contamination due to hull contamination of response vessels).
- Inadequate surveillance leading to poor information and unforeseen impacts.
- Inappropriate response implemented, and additional sensitive receptors impacted (e.g. shoreline clean-up for low loadings of highly weathered condensate).

7.3.1 Vessel, Aircraft and Helicopter Operations

Most of the identified response strategies will be implemented primarily with the use of vessels and aircraft. The impacts and risks associated with vessel and aircraft operations have been assessed elsewhere in this EP but will generate a level of impact above that associated with the Activity. An

increased level of impact could potentially occur during spill response from vessels and aircraft (due to the number required for a response, and the duration of the response) as described in:

- Disturbance to heritage values/sites (Section 6.2);
- Interference with other sea users (Section 5.3);
- Seabed disturbance due to anchoring (Section 5.4);
- Noise generation from vessels (Section 5.5);
- Emissions from exhaust gases from combustion (Section 5.6)
- Liquid discharges from vessels (Section 5.7);
- Solid waste from vessels (Section 5.8);
- Unplanned hydrocarbon spills from vessel collision, deck spills (Section 6.1 and 6.2);
- Vessel collisions, interaction and disturbance (to fauna) (Section 6.4); and
- Seabed disturbance due to dropped objects (Section 6.5).

The following activity is considered to not have material impacts:

- Light generation from vessels (Section 5.2).

7.3.2 Source Control

To control the source of hydrocarbons spilled to the marine environment, every effort will be taken. This will not result in further impact to the marine environment in the event of a Tier 1 or 2 spill as the activities will be undertaken on board the vessel in the case of a tank rupture or deck leak. Oily wastes generated will be disposed of in accordance with the EP with wastes disposed of onshore.

7.3.3 Monitor and Evaluate

No additional impacts are associated with this activity as it will be satellite and desktop based or vessel/aircraft based, in which case the associated impacts are already described above. Additional activities may include vessel-based monitoring during the operational and scientific monitoring which could lead to an increase in the possibility of behavioural and/or physiological impacts on marine fauna and other vessel related impacts as described in the EP.

7.3.4 Mechanical Dispersion

Vessels will be utilised for this activity which could result in impacts as described for generic vessels above.

7.4 PRIORITISATION OF SENSITIVE LOCATIONS

The potential impacts from a spill on sensitive receptors is assessed in Section 6.2 and summarised in Table 6-7.

Table 7-7 provides a summary of the sensitive receptors, including priority receptors, found at each location and recommendations for implementation of the oil spill response strategies considered viable for the activity spill scenarios.

Table 7-2: Summary of sensitive receptors, their location and assessment of oil spill response strategies

Sensitive receptor	OPEP response				
	Operational Area	Tier 2 Spill AMBA	Source control	Monitor & Evaluate	Mechanical Dispersion
Cetaceans	✓	✓	R	R	C
Sirenians	-	-	R	R	C
Marine reptiles	✓	✓	R	R	C
Seabirds	✓	✓	R	R	C
Fish (Sharks)	✓	✓	R	R	N/A
Fish spawning areas	✓	✓	R	R	C
Marine invertebrates	✓	✓	R	R	NA
Sandy beaches	-	-	R	R	C
Submerged reefs	-	-	R	R	N/A
Seagrass meadows	-	-	R	R	N/A
Mangroves	-	-	R	R	C
Commonwealth Marine Parks	-	✓	R	R	C
National and World Heritage	-	-	R	R	C
Key Ecological Features (KEF)	✓	✓	R	R	C
Fisheries	✓	✓	R	R	C
Tourism (Coastal)	-	-	R	R	C
Shipping	✓	✓	R	R	C

Key:
✓ = receptor present
- = receptor not present
R= recommended
C= considered
NR = not recommended
N/A = not applicable

7.5 UNMITIGATED RISK

The consequence of adverse impacts of oil spill response strategies is moderate and the likelihood highly unlikely due to the known benefits and assessment of each potential response strategy, resulting in an overall assessment of low.

7.5.1 Environmental Performance

Control measures, environmental performance outcomes, standards and measurement criteria for each response strategy identified are included in the OPEP. In addition, control measures, performance outcomes, standards and measurement criteria controlling many vessel and aircraft environmental impacts have been previously detailed within this EP. Environmental performance for the implementation of the overall response strategy is summarised below with environmental performance outcomes, standards and measurement criteria.

Environmental Performance Outcome	Minimise impact to the environment from spills through implementation of this EP's hydrocarbon emergency pollution response strategy Maintain communication with relevant stakeholders throughout response	
Control Measure	**Performance standard**	**Measurement criteria**
OPEP	Provide IMT with clear directions on response strategies	Post-desktop exercise report
NEBA	NEBA provides input to the IAP planning process to achieve the most effective response	IAP Operational NEBA
Consultation undertaken with stakeholders potentially impacted by spill response activities and spill	IMT through media officer provide daily updates on status of response efforts and spill impact with liaison through DPIRD - Fisheries for provision of appropriate advice to fishery licence holders in the area	Website updates, consultation evidence (emails)

7.5.2 Residual Risk

By implementing the control measures listed above, the consequence of the negative impacts of oil spill response strategies is minor and the likelihood highly unlikely. As such, the overall impact is considered low.

7.5.3 ALARP

In the event of a hydrocarbon spill to the marine environment, the operational NEBA is a key tool by which the response strategies are developed. The NEBA includes all practicable spill response strategies and by assessing these identification of those with the best net environmental benefit for the circumstances at the time is a primary tool to reduce the environmental risk to ALARP during a spill. A preliminary NEBA has been conducted on the basis of the predicted worst-case hydrocarbon spill extent

and knowledge of existing sensitive receptors. The most appropriate spill response strategies have been selected based on this assessment, but this NEBA will be updated with real-time information to ensure that impacts are continually reduced to ALARP during a spill response.

The selection of spill response strategies and implementation of spill response plans will be performed in collaboration with spill response providers and statutory authorities as outlined in the OPEP. Agreements have been reached with those who would have a role in the event of a spill through communications and arrangements to ensure all are familiar with their roles and responsibilities. Prior to commencing the monitoring survey, the measures that Western Gas will have in place will indicate response preparedness in the event of any tier hydrocarbon spill with the ability to reduce impacts to ALARP.

7.5.4 Acceptability

All practicable means to prevent releases of hydrocarbons into the marine environment are being undertaken, and the activities are typical of offshore activities undertaken elsewhere and in Australian waters. The spill response options selected are based on the likely hydrocarbon characterisations, consultation with oil spill response providers and the known sensitivities and values that could be impacted. Every effort has been made to identify suitable spill response options and to assess the impacts and benefits associated with each of these. Western Gas is satisfied that the oil spill response measures in place are acceptable given the low probability of occurrence and the potential receptors impacted.

During the Activity, given the control measures listed for this event, it is considered that all practical control and mitigation measures will be implemented to reduce the risk to an acceptable level.

Acceptability	
The level of residual environmental risk associated with the activity are low on the risk matrix	Yes
The level of residual environment risk was assessed as being ALARP	Yes
The activity (and associated potential risks and impacts) is compliant with relevant legislation, industry standards/guidelines and corporate policies, standards and procedures specific to the operational environment	Yes

7.6 AVAILABILITY OF SPILL RESPONSE RESOURCES

Prior to commencement of the inspection survey, the availability of key spill response personnel and equipment will be confirmed, and equipment-related contracts will be in place. The estimated time to mobilise personnel and equipment to Dampier or Exmouth for spill response implementation is about 8 hours. There is no shoreline contact predicted.

7.6.1 Capability and Scalability

When considering the level of capability required by Western Gas to respond to a Tier 2 hydrocarbon release event, the weathering and decay rates as well as lack of shoreline contact was considered (Section 6.2) to assess the potential requirement for spill response resources.

Western Gas estimates of resource requirements are provided in Table 7-4. Appropriate contracts will be in place prior to commencement of the inspection survey to enable immediate actions (i.e. first strike response) to be implemented and, where applicable, equipment and resources will be on standby. Western Gas are satisfied that service providers will provide the resources (personnel and equipment) to handle the required effort as predicated from hydrocarbon spill modelling and mass balance estimates. Critical service providers will also be required to participate in response test exercises.

7.7 RESPONSE TESTING ARRANGEMENTS

Western Gas' spill response testing arrangements for the OPEP are provided in Table 7-3

Table 7-3: Testing arrangements for the OPEP

Test	Objective	Schedule	Mechanisms to assess effectiveness	Mechanisms to address recommendations arising from the test
OPEP Desk-Based Exercise	Scenario will include Tier 2 oil spill. Adequacy of the IMT to facilitate a credible spill response. Adequacy of the OPEP and associated linkages. Notification and communication arrangements. Engagement of external parties identified to support the response. Media and/or external affairs management.	At least fourteen (14) days prior to the survey.	Assessment by external parties against requirements of the activity OPEP Feedback from external observers. Feedback from exercise participants. Written report incorporating feedback by exercise facilitator.	Tracking through Western Gas Corrective Action Register. Document updates as required. Additional training if required.
General Equipment Availability	Test that suppliers identified in the OPEP who provide critical equipment have the equipment available for immediate response.	At least ten (10) days prior to survey.	Email confirmation from suppliers of their current stock levels along with details of time to mobilise.	Tracking through Western Gas Corrective Action Register.
EP Audit	Ensure that the commitments relevant to spill response made in the EP and OPEP are being carried out as planned. Test understanding of those accountable for Performance Standards.	Onshore – at least one (1) week prior to vessel departure Offshore within one (1) day of vessel departure	Review of commitments made in EP & OPEP. Written report.	Tracking through Western Gas Corrective Action Register. Document updates as required. Additional training if required.

Table 7-4: Response strategy contracts in place prior to survey commencement

Response Strategy	Resource	Resource Provider	Resource Location	Contract Arrangement - equipment	Contract Arrangement - personnel
All strategies	Mutual Aid	Signatories to the Mutual Aid Agreement	Australia-wide	Vessels under contract to other operators, as available	Personnel under contract to other operators, as available
	Personnel and expertise	AMSA	Australia-wide	AMSA – Western Gas MOU	AMSA – Western Gas MOU
Monitor and Evaluate	Vessels	Survey vessel contractor	Dampier or Exmouth	Minimum 1 dedicated survey vessel for Activity. Additional vessels available through broker.	N/A
	Helicopters	Helicopter contractor	Exmouth or Karratha	Ad hoc call-off through pre-established contract	
	Fixed-wing aircraft	Aircraft contractor	Karratha	Ad hoc call-off through pre-established contract	Ad hoc call-off through pre-established contract
	Trained aerial observers	Trained aerial observers contractor	Perth	N/A	Ad hoc call-off through pre-established contract
	1x satellite tracking buoys on vessel	Satellite tracking buoy provider	Vessel	Hire or purchase	N/A
	Scientific Monitoring (Type II)	Scientific Monitoring contractor	Perth	Supplied by contractor	Ad hoc call-off through pre-established contract

8 IMPLEMENTATION STRATEGY

8.1 ENVIRONMENTAL MANAGEMENT SYSTEM

As required by Regulation 14(3) of the OPGGS (Environment) Regulations, Western Gas has prepared this implementation strategy for the design and execution of the Activity under the framework of Western Gas' Health, Safety and Environment Policy (WG-HSE-001) and Health, Safety and Environment (HSE) Management System (WG-HSE-002). The Western Gas HSE Management System defines the defines the principles by which Western Gas conducts its activities with regards to health, safety, and the environment.

8.1.1 Western Gas HSE Management System

The Western Gas Health, Safety and Environment (HSE) Management System (WG-HSE-002) is comprised of a number of interrelated components (Table 8-1). The Western Gas HSE Management System is modelled on a continual improvement cycle comprised of five distinct phases (commit, plan, do, check, and review) to drive overall and ongoing improvements in HSE performance. A summary of the key components and its applicability to this EP is summarised in Table 8-1.

8.1.2 Contractor Management Systems

Vessel Masters have ultimate responsibility for their vessel and persons on board, including compliance with legal requirements and *in situ* control of emergency situations or incidents. Roles and responsibilities relating to emergency situations are documented in various locations such as station bills, the project-specific Incident Response Plan, OPEP and the vessel SOPEP.

Table 8-1: Western Gas HSE Management System applicability to Activity

Phase	Component	Applicability/Contribution
Commit	HSE Policy (WG-HSE-001)	Leadership fostering an environment focused on establishing a culture which delivers HSE excellence.
Plan	Regulatory Requirements (WG-HSE-003)	Compliance with specific legal and other regulatory requirements, while achieving HSE objectives through effective identification, assessment and communication of requirements to relevant Western Gas staff and contractor personnel.
	Risk Management (WG-HSE-004)	Effective management of risk is recognised as an essential component of the HSE Management System to ensure that activities are performed safely and effectively. Risk assessments are performed for all activities.

Phase	Component	Applicability/Contribution
Do	Training and Competencies (WG-HSE-005)	Ensuring individuals have the training, qualifications and competencies appropriate with their roles and responsibilities and HSE expectations.
	Contractor Management (WG-HSE-006)	Effective management of contractors is required to ensure HSE performance throughout the life cycle of a contract, from contractor selection through post-contract performance.
	Management of Change (WG-HSE-007)	Changes to approved work programs (e.g.: Systems, Legislation, Procedures, Equipment, Products, Materials, Planning and Execution, etc.) are to be assessed to identify and manage internal and external implications and to be approved if acceptable, by the appropriate personnel.
	Emergency Response Arrangements (WG-HSE-008)	An effective emergency preparedness system shall be in place, in accordance with the Activity specific Emergency Response Plans (ERP) required prior to an activity commencing. The ERP shall provide identification, assessment and guidance in the management of potential adverse situations, including events such as medical emergencies, environmental incidents, fires, blowouts, security issues and natural disasters.
	Incident Reporting and Investigation (WG-HSE-009)	Incident investigation systems that identify, evaluate, communicate and whenever possible eliminate potential hazards. Timely and thorough incident investigation helps provide prompt corrective action and a means for information sharing to help prevent similar events from occurring elsewhere.
	Records Management (WG-HSE-10)	HSE documents and records will be managed to ensure current versions are available and promptly removed from service when obsolete. HSE documents and records are to be stored in a manner that makes retrieval practicable. Details HSE records that are required to be retained and the period of retention.
Check	Performance Measurement and Monitoring (WG-HSE-11)	Assessment of HSE performance by gathering and analysing appropriate HSE data and reporting on performance. HSE information is effectively communicated as appropriate within Western Gas to ensure adjustments to priorities, updates to Management System and allocation of resources necessary to achieve HSE objectives.
	Audit and Verification (WG-HSE-012)	Audits and management reviews to verify the adequacy of the HSE controls for activities to evaluate their effectiveness and to identify improvement opportunities. Audits shall be conducted on a regular basis as defined in the appropriate activity plans. Audit finding are recorded, and appropriate action is taken to assure closure and track findings, best practices and key lessons learned.

Phase	Component	Applicability/Contribution
Review	Management Review (WG-HSE-013)	Management reviews are conducted in a consistent and visible way as means of reviewing HSE performance and effectiveness the HSE Management System.

8.2 MONITORING, RECORDING, AUDITING AND REVIEW

8.2.1 Monitoring and record keeping

The following information will be monitored and recorded during the Activity (Table 8-4 and Table 8-5).

All records relevant to the EP will be stored and made available in accordance with Regulation 27 and 28 of the OPGGS (Environment) Regulations. Western Gas will generate and store records for a period of five years upon completion of the Activity including the items detailed in Regulation 27 of the OPGGS (Environment) Regulations.

Table 8-2: Monitoring and recording requirements for the Activity

Activity	Monitoring	Record keeping
Training	Details of crew environmental inductions.	Induction Record Sheets.
Waste management	Quantities of waste landfilled, recycled and discharged.	Vessel Waste Log, Rubbish record book, Spill response operations – waste transfer logs, ODS Record Book.
Fauna interactions	Cetacean and turtle sightings. Any interactions between marine fauna and vessels.	DoEE cetacean sightings report forms and records of transmittal to DoEE and NOPSEMA. Turtle sighting records. Vessel-marine fauna interaction records.
Incident reporting	Number and details of environmental incidents.	EHS incident reports.
Compliance reporting	Compliance with EP performance outcomes.	Completed environmental inspection / audit check sheet.
Maintenance	Maintenance schedule for applicable equipment.	PMS records.
On-going Consultation	Records of consultation with stakeholders.	Transmittals to stakeholders and responses.

Table 8-3: Emissions and discharges to be recorded and reported to NOPSEMA at end of Activity

Emission or discharge	Information recorded	By whom and when	Records and reporting
Oil in water discharged overboard from vessels >400 tonnes	Volume and concentration of oil discharged.	Chief Engineer, after each batch discharge or daily for ongoing.	Oil record book. Data provided at end of activity.
Waste from vessels	Quantities and types of waste backloaded to shore.	Chief Engineer, after each backload	Waste records maintained on vessels. Data provided at end of activity.
Dropped objects	Type, location, quantity.	Vessel Master, as required.	Incident reports completed and copied to Western Gas Project Survey Manager.

Emission or discharge	Information recorded	By whom and when	Records and reporting
Fuel use and associated atmospheric emissions	Volume of fuel used.	Vessel Master, Daily records	Data provided at end of activity. Emissions calculated using emissions factors by Western Gas Project HSE Specialist.
Sewage from vessels >400 tonnes	Volumes discharged overboard.	Chief Engineer estimates at end of Activity.	Data provided at end of Activity.

8.2.2 Audit

Western Gas conducts reviews and audits of contractors at various stages including pre-award of contract, and prior to and during the Activity in accordance with its HSE Management System.

The following audits of the vessel will be undertaken to ensure the survey is being undertaken in accordance with this EP, and relevant legislation:

- Pre-Activity EHS and condition audits of the vessel by Western Gas; and
- EHS audit of the vessel during operations by vessel based personnel.

The audits will be documented, and corrective actions will be tracked to completion in accordance with the Western Gas Audit and Verification Standard (WG-HSE-012).

Results from these audits will inform the annual EP performance report submitted to NOPSEMA.

Each contractor's internal environmental performance monitoring and auditing commitments are detailed in its EHS Management System, including identification and management of non-conformance. These processes will ensure that continual monitoring and improvement occurs so that EHS performance meets the requirements of the organisation's EHS policies and Vessel Safety Case (if relevant), as well as applicable requirements from the EP (as documented in the Commitments Register).

8.2.3 Review

Performance reviews will be conducted at least annually to meet regulatory reporting requirements (Section 8.6) and in the event of non-conformances. Non-conformances comprise incidents, audit findings, failures to meet defined outcomes and objectives, and deviations from standards and procedures. Other potential improvements may be identified via observations of potential reductions to risk(s) or improved performance. Mechanisms for identifying and managing non-conformances associated with the Activity include:

- Audits and inspections (e.g. those conducted prior to or during the Activity);

- Incident reports;
- Reports from personnel (e.g. hazard observations); and
- Incidents such as spills.

A key mechanism to resolve potential non-conformances is the daily meeting ('Morning Call'), whereby the Western Gas Project Offshore Representative will communicate these items to Western Gas onshore management. Depending on the nature and level of non-conformance, the issue may be recorded in the Vessel Contractor's and/or Western Gas' non-conformance process (Corrective Actions Register). For example, a low risk observation around waste segregation identified offshore by a Vessel Contractor may only be recorded in the contractor's non-conformance process. A spill of oil to sea will be of greater concern (risk) and benefit in Western Gas following up and recording through its own systems. It is the responsibility of the Western Gas Project Offshore Representative and Project Survey Manager (with input from the Western Gas Project HSE Specialist and with consideration of the level of risk) to determine the appropriate recording of the incident with regard to Western Gas' HSE Management System.

8.2.4 Changes to EP Scope

Identification and potential approval of changes to scope (e.g. timing or operational details described in this EP) is the responsibility of Western Gas Project Survey Manager, in conjunction with the Western Gas Project Director. A risk assessment will be undertaken for any change in scope in order to assess potential impacts of the change. If the change represents a significant modification that is not provided for in the accepted EP in force for the Activity, a revision of the EP will be conducted in accordance with Regulation 17(6) of the OPGGS (Environment) Regulations.

Western Gas' Management of Change (WG-HSE-007) provides direction for Management of Change for Westen Gas activities. It shall be used to ensure changes to approved work programs (e.g. systems, legislation, procedures, equipment, products, materials and planning etc.) are properly considered, and approved if acceptable, by the appropriate personnel.

9 STAKEHOLDER CONSULTATION

9.1 INTRODUCTION

Stakeholder engagement is an important part of the environmental approvals process, and Western Gas is committed to consulting with those stakeholders who may be impacted by the proposed Activity.

Consultation with potentially affected stakeholders has been undertaken to provide information on the Activity, to identify and understand any concerns and issues and to inform the development of the Activity, the EP and the OPEP as appropriately and practically as possible.

The stakeholder environment can be dynamic, and it is recognised that it is possible that over the course of the project new stakeholders may emerge or the interest of existing stakeholders may change. Western Gas has an ongoing stakeholder consultation program (Section 9.5) and will continue to seek advice on relevant persons for consultation from identified stakeholders, capturing all stakeholder data in its Stakeholder Register.

9.2 STAKEHOLDER CONSULTATION

Hess, as the previous Operator of the WA-474-P and WA-70-R titles, has undertaken ongoing stakeholder engagement for activities in these titles including consultation for the suspended wells and associated inspection survey covered by this EP.

An expanded stakeholder identification process was undertaken in early 2015, in line with the guidance provided by the OPGGS (Environment) Regulations, to provide for consultation with all potentially affected or interested stakeholders as part of the environmental approvals process.

The focus of the engagement was to introduce the WA-474-P Exploration Drilling Campaign and to seek input on the potential impacts of the Activity proposed by Hess. This consultation built on the extensive previous consultation undertaken for activities in Permit Area WA-390-P (now WA-70-R).

Organisations formally consulted during the planning phase of the exploration drilling campaign are provided in Table 9-1. Each of organisations was issued a project information sheet and follow up phone calls were made where necessary. Further consultation regarding the ongoing suspension of the five wells in WA-474-P and WA-70-R, including details of the proposed inspection survey, was undertaken in April/May 2017. Since the scale of operations and the AMBA identified for well suspension was considerably reduced from that for exploration activities, and with consideration of responses to previous engagement and the desire to avoid stakeholder ‘consultation fatigue’ a selected subset of stakeholders were engaged. Follow up consultation was undertaken in November 2017. Stakeholders engaged in 2017 are bolded in Table 9-1.

9.3 STAKEHOLDER CONSULTATION OUTCOMES

Overall, there have been no objections and few specific issues or concerns raised by stakeholders regarding the proposed Activity at the time of submission. Western Gas, and previously Hess, considers it has undertaken best endeavours to understand and address matters raised, which are relevant to the scale, nature and duration of the proposed Activity. Western Gas recognises that stakeholders may continue to have an interest in the Activity, particularly the timing of survey operations once these are confirmed, and therefore Western Gas will maintain ongoing stakeholder engagement following EP assessment and approval.

A summary of the stakeholder responses received in regards well suspension to date is provided in Table 9-2. A full text copy of stakeholder correspondence was provided with the EP submission to NOPSEMA.

Table 9-1: Relevant stakeholders

Stakeholders	
Australian Fisheries Management Authority (AFMA)	**WA Department of Mines and Petroleum**
Australian Hydrographic Service (Dept. of Defence)	**WA Department of Parks and Wildlife – Environmental Management Branch**
Australian Institute of Marine Science (AIMS)	**Department of Regional Development (Now Dept of Lands)**
Australian Institute of Petroleum (API)	**WA Department of Transport**
Australian Marine Conservation Society	Exmouth Chamber of Commerce and Industry
Australian Marine Oil Spill Centre (AMOSC)	Exmouth Freight and Logistics (Toll IPEC)
Australian Maritime Safety Authority (AMSA) – Marine Environment Division (Marine Environment Pollution Response)	**Gascoyne Development Commission**
Australian Maritime Safety Authority (AMSA) – Nautical Advice	Karratha and Districts Chamber of Commerce and Industry
Australian Petroleum Production and Exploration Association (APPEA)	**Jamaclan Marine Services**
Australian Southern Bluefin Tuna Industry Association	**Member for North West Central (State Government Elected Representative)**
BHP Billiton Petroleum	**Minister for Environment; Heritage**
Cape Conservation Group	**National Offshore Petroleum Safety and Environment Management Authority**
Centre for Whale Research	National Offshore Petroleum Titles Administrator
Chevron Australia	North West Cape Exmouth Aboriginal Corporation
City of Karratha (formerly Shire of Roebourne)	**Pearl Producers Association**
Commonwealth Fisheries Association including the following Commonwealth managed fisheries associations: 1. Skip Jack Fishery; 2. Southern Bluefin Tuna Fishery	Pilbara Development Commission

Stakeholders	
3. Western Deepwater Trawl Fishery 4. Western Tuna and Billfish Fishery; and 5. North West Slope Trawl Fishery.	
Defence Airspace (aerial activity only)	**Pilbara Ports Authority (formerly Darwin Port Authority)**
Department of Defence - Defence Public Affairs (WA)	RecFishWest
Department of Defence - Defence Support and Reform Group	**Royal Australian Air Force**
Department of Defence - Border Protection Command	Shire of Exmouth
WA Department of Environment Regulation (formerly Department of Environment and Conservation)	**Minister for Mines and Petroleum**
Department of the Environment Offshore Assessment, Environmental Assessment and Compliance Division	Total E&P Australia
Department of the Environment Commonwealth Marine Parks, Parks Australia Division	Woodside Energy Ltd
WA Department of Primary Industries and Regional Development – Fisheries (previously Department of Fisheries)	**Western Australian Fishing Industry Council (WAFIC)** including all licence holders in the following State Fisheries: 6. Mackerel Managed Fishery; 7. West Coast Deep Sea Crustacean Managed Fishery.

Table 9-2: Summary of stakeholder responses received to date, response and follow-up

Stakeholder	Consultation activity	Stakeholder response	Stakeholder objections or claims	Response	EP Reference
Australian Government Regulators					
Department of the Environment and Energy	Letter and email sent. Email received	DoEE advised it was not a relevant person for the purposes of EP consultation.	No objections or claims made.	Not required.	N/A
Australian Marine Oil Spill Centre	Letter and email sent. Follow-up telephone call.	Provided clarification on services provided and requested inclusion on the mailing list for the updated EP.	No objections or claims made.	Not required.	Noted in OPEP. Noted in EP Section 7.3: and 8.5 regarding AMOSC services
Australian Maritime Safety Authority – Marine Environment Division (Marine Environment Pollution Response)	Letter and email sent.	AMSA email response received requesting well details are provided to AHS and advising that AMSA has no other comments.	No objections or claims made.	Well details provided to AHS.	N/A
Australian Maritime Safety Authority – Nautical Advice	Email and letter sent.	No response received at time of EP submission	No objections or claims made.	Not required.	N/A
Australian Fisheries Management Authority	Letter and email sent.	No response received at time of EP submission	No objections or claims made.	Not required.	N/A
Parks Australia	Letter and email sent. Email received.	Provided information on the marine park. Requested that future planning of periodic sub-sea monitoring activities, give consideration to the potential impacts of a vessel collision and subsequent fuel/oil spill on the conservation values of the marine parks, and risk to those values, and demonstrate plans to reduce impacts to as low as reasonably practicable. Specific marine park values that should be considered include seasonal calving for humpback whales, foraging area for various turtle species and whale sharks.	No objections or claims made.	Specific marine park value of seasonal calving for humpback whales does not align with Gascoyne Marine Park values detailed in the Draft North-west Commonwealth Marine Reserve Network Management Plan or the conservation values on the DoEE website http://www.environment.gov.au/topics/marine/marine-reserves/north-west/gascoyne	Noted in EP Section 6.1 regarding consideration to potential impacts to conservation values of the marine park from a vessel collision oil spill and controls to manage to ALARP.

Stakeholder	Consultation activity	Stakeholder response	Stakeholder objections or claims	Response	EP Reference
				The PMST and BIA search did not identify any humpback whale calving area within the AMBA.	
State Government Regulators and Agencies					
Department of Mines and Petroleum	Letter and email sent. Email response received.	The stakeholder acknowledged receipt of information provided and requested further clarification on 5 points, including confirmation that any incidents with the potential to impact State waters would be reported to DMP. After follow up, acknowledged receipt of responses and advised that no further information required at this stage.	No objections raised or claims made.	Noted the request regarding providing notification of incidents with the potential to impact State waters.	Noted in Section 8.7: Reportable Incidents.
Department of Environment Regulation (formerly Department of Environment and Conservation)	Letter and email sent.	Email received stating it has been forwarded for action/response as required.	No objections raised or claims made.	Not required.	N/A
Department of Parks and Wildlife	Letter and email sent.	No response received at time of EP submission.	No objections raised or claims made.	Not required.	N/A
Department of Primary Industries and Regional Development – Fisheries (previously Department of Fisheries)	Letter and email sent. Email response received.	The Department advised that impacts of planned activities were unlikely to be significant and that it has no objections to the Activity provided consultation undertaken with AFMA. The Department requested that strategies be included in the OPEP to mitigate the impact of an oil spill on fish spawning and nursery areas and provided a list of the key fish species.	No objections or claims made.	Noted the advice received and lack of objection, as AFMA has been consulted.	Noted in OPEP and in EP Section 3: Existing Environment; Section 5: Impact Assessment of Planned Events; Section 6: Risk Assessment of Unplanned Events; Section 7: Hydrocarbon Pollution Emergency Response.

Stakeholder	Consultation activity	Stakeholder response	Stakeholder objections or claims	Response	EP Reference
Department of Transport – Marine Safety	Letter and email sent.	Email received stating it has been forwarded for action/response as required.	No objections raised or claims made.	N/A	N/A
Department of Regional Development (Now Dept. of Lands)	Letter and email sent.	No response received at time of EP submission.	No objections raise or claims made to date	N/A	N/A
Pilbara Ports Authority (formerly Darwin Port Authority	Letter and email sent.	No response received at time of EP submission.	No objections raised or claims made.	N/A	N/A
Gascoyne Development Commission	Letter and email sent.	No response received at time of EP submission.	No objections raised or claims made.	Not required.	N/A
State Government Ministers					
Minister for Environment; Heritage	Letter and email sent.	Email received stating it has been forwarded for action/response as required.	No objections raised or claims made.	Not required.	N/A
Minister for Mines and Petroleum	Letter and email sent	Email received stating it has been forwarded for action/response as required.	No objections raised or claims made.	Not required.	N/A
State Government Elected Representative					
Member for North West Central	Letter and email sent	No response received at time of EP submission	No objections raised or claims made.	Not required.	N/A
Defence Organisations					
Australian Hydrographic Service	Letter and email sent.	Acknowledgment email received.	No objections raised or claims made.	Not required.	N/A
Border Protection Command	Letter and email sent.	No response received at time of EP submission.	No objections or claims made.	Not required.	N/A
Department of Defence - Defence Support and Reform Group	Letter and email sent.	No response received at time of EP submission	No objections or claims made.	Not required.	N/A
Department of Defence - Defence Public Affairs (WA)	Letter and email sent.	No response received at time of EP submission.	No objections or claims received at time of EP submission.	Not required.	N/A
Royal Australian Air Force	Letter and email sent.	No response received at time of EP submission.	No objections or claims made to date.	Not required.	N/A

Stakeholder	Consultation activity	Stakeholder response	Stakeholder objections or claims	Response	EP Reference
Government Research Organisations					
Centre for Whale Research	Letter and email sent.	No response received at time of EP submission.	No objections or claims made.	Not required.	N/A
Environmental Non-Governmental Organisations					
Australian Marine Conservation Society	Letter and email sent.	No response received at time of EP submission.	No objections or claims received at time of EP submission.	N/A	N/A
Cape Conservation Group	Letter and email sent.	No response received at time of EP submission.	No objections or claims received at time of EP submission.	N/A	N/A
Petroleum Industry Representative Bodies					
Australian Institute of Petroleum	Letter and email sent.	No response received at time of EP submission.	No objections or claims made.	N/A	N/A
Australian Petroleum Production and Exploration Association	Letter and email sent.	No response received at time of EP submission.	No response received at time of EP submission.	N/A	N/A
Fishing Industry Representative Bodies					
Commonwealth Fisheries Association	Letter and email sent.	CFA advised that consultation at the fishery level is best handled by regional industry associations where they exist. The duty is on the commercial proponent and appropriate methods to be used. CFA does not consider information provision alone constituting appropriate and meaningful consultation. Confirmation that CFA had forwarded on information to WAFIC and Austral Fisheries that could be potentially affected.	Provision of information in regard to the well suspension activity is the first stage in the consultation process to identify stakeholders who may be interested in the activity. Where a stakeholder has responded further engagement is undertaken.	Response was provided to acknowledge CFA's position and detailed that consultation had been ongoing since 2008 and will continue as part of the survey inspection ongoing consultation process.	EP Section 9.6 Ongoing Consultation details consultation prior to the inspection survey.
Western Australian Fishing Industry Council	Letter and email sent. Email response.	WAFIC forwarded information on to Licence Holders in the Gascoyne Demersal Scalefish Fishery, Mackerel Fishery (Area 3) and West Coast Deep Sea Crustacean Fishery.	No objections or claims made.	N/A	N/A

Stakeholder	Consultation activity	Stakeholder response	Stakeholder objections or claims	Response	EP Reference
Pearl Producers Association	Letter and email sent.	No response received at time of EP submission.	No response received at time of EP submission.	N/A	N/A
Australian Southern Bluefin Tuna Industry Association	Letter and email sent.	ASBTIA advised that the area of the activity is outside their current areas of concern for purse-seining and long-lining operations. Asked that they are advised once Western Gas has decided what they are doing with the suspended wells. Also asked who was responsible for the integrity of the wells until such as decision is made.	No objections or claims made.	Western Gas replied that they will keep ASBTIA informed as the project matures by way of ongoing consultation to support Environment Plans for future activities, including those relating to the wells and their integrity, for which Western Gas now has responsibility.	N/A
Individual Fishers					
Austral Fisheries Pty Ltd	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A
Raptis Fishing Licences Pty Ltd	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A
Jamaclan Marine Services	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A
Lucky S Fishing Pty Ltd	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A
Seafresh Holdings Pty Ltd and WA Seafood Exporters Pty Ltd	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A
WA Seafood Exporters Pty Ltd	Letter and email sent.	No response received at time of EP submission.	No response received at time of EP submission.	N/A	N/A
WA Fishing Developments Pty Ltd	Letter and email sent.	No response received at time of EP submission	No response received at time of EP submission.	N/A	N/A

9.4 ONGOING STAKEHOLDER ENGAGEMENT PROGRAM

Western Gas' proposed consultation program provides for continued and ongoing engagement with stakeholders throughout project planning and operations, as shown in Table 9-3, and provides for the flexibility to accommodate new stakeholders that may emerge following submission of the EP. The aim of ongoing engagement is to:

- Maintain an open dialogue regarding the proposed survey program timing and activities as approvals are secured and a vessel contracted;
- Encourage stakeholders to continue to raise concerns and queries directly with Western Gas for response or resolution throughout the project planning and operation phases; and
- Provide for an update to identified stakeholders following the conclusion of operations.

In addition to this program, appropriate stakeholders will also be contacted in line with reporting requirements that are not necessarily directly associated with consultation. Additional stakeholder engagement may also be undertaken as required.

Western Gas values all comments and feedback received from stakeholders and will assess the evidence of stakeholder objections or claims about the proposed Activity in order to take appropriate action where it considers it relevant to do so, which may include addressing the matters in management or operations plans.

Should Western Gas consider amendment to the approved EP or OPEP be required because of stakeholder feedback, Western Gas will seek to make these amendments in accordance with NOPSEMA's requirements. Western Gas will advise stakeholders of the response to the feedback provided and any resultant action taken.

Table 9-3: Ongoing stakeholder engagement program

Stakeholder	Activity	Purpose of Engagement	Timing
All identified stakeholders	Letter/ Email	Advise stakeholders of NOPSEMA approval of the EP and OPEP directing stakeholders to the summary of the EP. Provide further opportunity for stakeholders to raise queries and further comment	Commence within four weeks following NOPSEMA approval of the EP
Other marine users of the Operations Area	Letter/ Email	Provide notification of vessel details and timing/location of operations. Provide further opportunity for stakeholders to raise queries and further comment.	Commence no less than one month prior to commencing survey
Organisations and contractors involved in emergency response	Email	Provide notification when survey vessel has been contracted and timing of survey confirmed. Consultation regarding emergency spill response activities.	Commence within one week after the survey vessel has been contracted and timing confirmed

Stakeholder	Activity	Purpose of Engagement	Timing
NOPSEMA and DMP	Written Notification	Formal notification of survey start date, and after its completion. Formal notification at end of Activity.	At least 10 days before the survey commences, and as soon as practicable (no later than 10 days) after the completion.
Joint Rescue Coordination Centre (AMSA)	Email	Contact for Auscoast warning broadcasts. Provide notification of vessel details and timing/location of operations. Advise when survey has completed.	Commence no less than two weeks prior to commencing survey and at completion of survey
Australian Hydrographic Service (Department of Defence)	Email	Provide notification of timing of survey for promulgation of Notice to Mariners.	Commence no less than two weeks prior to commencing survey and at completion of the survey.