Browse Regional Operational and Scientific Monitoring Bridging Implementation Plan

Document Number	HSE_PRE_016370
PML (SAP) Number	n/a
Revision Number	3.0
Document Status	Approved for Use
Revision Date	27-Jul-22
Cyclical Review Cycle	5 Years (Procedures)
Safety Critical Content	[Not Safety Critical]
Technical Reviewer (TA2 or SME)	n/a
Process Area	HSSE

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Rev	Revision Update Description	Date Changed	BCD Development Roles Authors, Reviewers, Approvers	
2.1	Updated to broaden scope to the Browse Region for submission with the Crux Development Drilling EP	25-Jul-22	Environment Approvals Advisor Crux Environment Lead Environment Advisor Environment Manager West	Author Reviewer (SME) Reviewer (SME) Approver (PO)
3.0	Approved for Use	27-Jul-22	Environment Approvals Advisor Crux Environment Lead Environment Advisor Environment Manager West	Author Reviewer (SME) Reviewer (SME) Approver (PO)

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Part A – Preparedness

This Plan is presented in two parts. Part A outlines the relationship between the Shell Australia Pty Ltd.'s (Shell) environmental management document framework and the Joint Industry Operational and Scientific Monitoring (OSM) Framework (APPEA, 2021). Part B provides operationally focussed guidance for Titleholder personnel and OSM Service Providers to coordinate the implementation of monitoring plans.

1 Introduction

Shell has elected to use the Joint Industry OSM Framework and supporting Operational Monitoring Plans (OMPs) and Scientific Monitoring Plans (SMPs) as the foundation of its operational and scientific monitoring approach. The Joint Industry OSM Framework is available on the APPEA Environment Publications Webpage. Use of the Joint Industry OSM Framework requires each Titleholder to develop a Bridging Implementation Plan (this plan) which fully describes how the Framework interfaces with Titleholders own activities, spill risks and internal management systems.

Table 1-1 describes key documents that form Shell's environmental management document framework.

Activation of OSM should follow the process listed in Part B: Section 0 Part B – Implementation Activation Process.

Table 1-1: Key documents in Shell's environmental management framework

Document	Description
Activity specific Environment Plan (EP)	These plans describe the petroleum activities, location of activities, the environment, the risks to the environment as a result of the activity and the associated management controls. Of particular relevance to this plan, it identifies sensitive receptors, potential impacts from hydrocarbon spills and the Environment that May be Affected (EMBA).
Browse Regional Oil Pollution Emergency Plan (HSE_PRE_013075) (OPEP) and associated Basis of Design and Field Capability Assessment (HSE_GEN_016764)	This plan provides the activation and response process for the credible spill scenarios, including incident management, spill impact mitigation analysis (SIMA)/net environmental benefit (NEBA) process and detailed implementation guidance for individual response options. Of particular relevance to this plan, it identifies the credible spill scenarios and protection priorities.
Shell Incident Management Team (West) (IMT(W)) Emergency Response Plan (HSE_GEN_011209)	Describes roles and responsibilities of the Level 2 IMT(W) in response to an all hazards emergency, with the exception of OSMP roles which are detailed in this plan

Weekly Contact List Work Instruction (HSE_GEN_011648)	This work instruction contains all relevant contact and communications information to enable effective communication amongst the response personnel and also external stakeholders. It is updated and kept live at all times and includes relevant OSMP contacts

2 Environment that May Be Affected and Monitoring Priorities

The Browse Regional OPEP (HSE_PRE_013075) and associated Browse Region Oil Pollution Emergency Plan - Basis of Design and Field Capability Assessment (HSE_GEN_016764) provides for a holistic approach to oil spill monitoring planning for all of Shell's activities in the Browse Basin.

Activity-specific EPs within the Browse region include the outer boundary of the Environment the May be Affected (EMBA) which is based on the following thresholds (Refer to Browse Regional OPEP BOD – Section 4):

- 1 g/m^2 floating oil thickness, which is considered to be below levels which would cause environmental harm and is more indicative of the areas perceived to be affected due to its visibility on the sea-surface;
- 10 g/m^2 for accumulated (shoreline) oil, which represents the area visibly contacted by the spill;
- 10 ppb for entrained hydrocarbons represents the lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARMCANZ (2000) water quality guidelines; and
- 6 ppb dissolved aromatic hydrocarbons represents the low exposure zone, although it is not considered to be of significant biological impact.

Section 3.2 and 3.3 of the Browse Regional OPEP (HSE_PRE_013075) describes the process for identifying values and sensitives and setting monitoring priorities across different seasons within the EMBA. This process utilises spill modelling to identify the protection priorities while also setting processes to evaluate these using data from an actual spill event. This ensures that monitoring priorities are focused on key sensitive receptors with high conservation value, including habitat, species and important socio-economic/heritage values.

Detailed information on the spill risks, modelling analysis of scenarios and protection priorities are provided in the activity-specific EPs and Browse Regional OPEP (HSE_PRE_013075) and associated Browse Region Oil Pollution Emergency Plan - Basis of Design and Field Capability Assessment (HSE_GEN_016764).

The relationship between exposure levels and degree of impact should be considered when finalising the monitoring design. Shell will work with its monitoring providers and key stakeholders in the initial stages of the spill to confirm priority receptors and to assist in the finalisation of the monitoring design. This process is outlined in Section 13.

3 Relevant Existing Baseline Information Sources

Shell has access to a number of different baseline data sources that are relevant to the high value receptors in the Browse Region. These include:

Industry-Government Environmental Metadata System (I-GEMS)

The I-GEM Project is facilitated by the Australian Petroleum Production and Exploration Association (APPEA). The project is a collaborative approach between industry, marine research institutes and Western Australian government agencies to share metadata on quantitative ecological data for key receptors in the mid to north-west of WA (approximately from the Abrolhos Islands to the Timor Sea) and to represent these in a geospatial database.

The marine environmental metadata includes instant online access to a list of available data sets on key receptor sensitivities in the event of spill. Shell's login access information can be found in the Shell IMT Weekly Contact List (HSE_GEN_011648).

Australian Ocean Data Network

The Australian Oceans Data Network is the primary access point for search, discovery, access and download of data collected by the Australian marine community. Data is presented as a regional view of all the data available from the Australian Ocean Data Network. Primary datasets are contributed to by Commonwealth Government agencies, State Government agencies, Universities, the Integrated Marine Observing System an Australian Government Research Infrastructure project, and the Western Australia Marine Science Institute.

Access is via the following link https://portal.aodn.org.au/search

Western Australian Oil Spill Response Atlas

The Western Australian Oil Spill Response Atlas (OSRA) is a spatial database of environmental, logistical and oil spill response data. Using a geographical information system (GIS) platform, OSRA displays datasets collated from a range of custodians allowing decision makers to visualise environmental sensitivities and response considerations in a selected location. Oil spill trajectory modelling (OSTM) can be overlaid to assist in determining protection priorities, establishing suitable response strategies and identifying available resources for both contingency and incident planning. OSRA is managed by the Oil Spill Response Coordination unit within Department of Transport (DoT) Marine Safety and is part funded through the National Plan for Maritime Environmental Emergencies and the Australian Maritime Safety Authority.

Access is via the following link https://www.transport.wa.gov.au/imarine/oil-spill-response-and-planning-tools.asp

The Atlas of Living Australia

The Atlas of Living Australia (ALA) is a collaborative, online, open resource that contains information on all the known species in Australia aggregated from a wide range of data providers. It provides a searchable database when considering species within the EMBA. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy and is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Access is via the following link https://www.ala.org.au/

The EMBA is also covered by the following government management plans that identify the current condition of key receptors being managed for protection:

- Rowley Shoals Marine Park Management Plan (2007) 2007-2017, Management Plan No. 56. DEC, Perth, WA
- Department of Parks and Wildlife (2014) Eighty Mile Beach Marine Park Management Plan 2014-2024, Management Plan No. 80, DPaW, Perth, WA
- Department of Parks and Wildlife (2016) North Kimberley Marine Park Joint management plan 2016. Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management areas, No. 89. DPaW, Perth, WA
- Department of Parks and Wildlife (2013) Lalang-garram / Camden Sound Marine Park management plan No. 73 2013–2023, DPaW, Perth, WA

Species recovery plans for various protected species and ecological communities can be found in this link - http://www.environment.gov.au/cgi-bin/sprat/public/publicshowallrps.pl

4 Baseline Data Review

Shell has compiled a list of baseline data relevant to the high value receptors in the Browse Region (Appendix A: Baseline Data Sources) and reviewed this baseline information (OSM Baseline Environmental Data Analysis - HSE_GEN_016977) to assess the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs. As an example, this exercise focused on priority monitoring locations with a minimum hydrocarbon contact timeframe of less than seven days using the 42,000 m^2 over 2 hours (vessel collision) spill scenario.

The criteria used during the baseline data review is outlined in Table 4-1.

Table 4-1: Assessment criteria for baseline data review

Year of most recent data capture	Duration of monitoring program	Frequency of data capture	Similarity of methods to Joint Industry SMP	Similarity of parameters to Joint Industry SMP
High = 2015-2020	High = > 4 years	High = 4+ sampling trips per year	High	High
Medium = 2010 – 2014	Medium = 2-4 years	Medium = 2-3 sampling trips per year	Medium	Medium
Low = <2010	Low = <2 years	Low = one-off sampling trip	Low	Low

This example assessment was then used to determine if the available baseline data could be used to detect change in receptors at priority monitoring locations in the event of a significant impact. Table 4-2 compares priority monitoring locations and receptors, and provides guidance on where post-spill, pre-impact monitoring should be prioritised.

The different categories listed in Table 4-2 include:

Not applicable (N/A) – this receptor and relevant SMP is not applicable to the priority monitoring location (i.e. shoreline habitat not present at submerged shoals);

Survey - current monitoring/knowledge is considered sufficient (i.e. could be used to detect level of change in the event of a significant impact) and is considered a lower priority for post-spill, pre-impact data collection; and

Priority survey - current monitoring/knowledge is not in place, not suitable or not practicable; and post-spill pre-impact baseline data collection should be prioritised.

It is noted that it is difficult to obtain absolute statistical proof of oil spill impacts, due to the variability (spatially and temporally) of the natural environment, the lack of experimental control due to the nature of spills and because suitable baseline data may not be available (Kirby, et al. 2018). Alternative approaches exist for detecting impacts where post-spill, pre-impact monitoring may not be feasible. These include impact versus control design approaches and/or a gradient approach. The Joint Industry OSMP Framework provides guidance and considerations for survey designs to enable the acquisition of sufficiently powerful data during SMP implementation.

Once SMP monitoring reports are drafted (post-spill) they should be peer reviewed by an expert panel (Refer to Section 10.10 of the Joint Industry OSM Framework).

Table 4-2: Example of recommended priority monitoring locations versus SMPs

Location	SMP									
	Water quality impact assessment	Sediment quality impact assessment	Intertidal and coastal habitat assessment	Seabirds and shorebirds	Marine mega-fauna assessment - reptiles	Marine mega-fauna assessment - whale sharks, dugong and cetaceans	Benthic habitat assessment	Marine fish assemblages assessment	Fisheries impact assessment	Heritage and social impact assessment
Browse Island (emergent receptor)	Priority survey	Priority survey	Priority survey	Survey	Priority survey	Priority survey	Survey	Survey	Priority survey (Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort)	Priority survey (Locations to be determined in consultation with key stakeholders)
Cartier Island (emergent receptor)	Priority survey	Priority survey	Priority survey	Priority survey	Priority survey	Priority survey	Survey	Priority survey		
Vulcan Shoal (submerged receptor)	Priority survey	Priority survey	N/A	N/A	N/A	Survey	Survey	Survey		
Echuca Shoal (submerged receptor)	Survey	Survey	N/A	N/A	N/A	Survey	Survey	Survey		
Heywood Shoal (submerged receptor)	Survey	Survey	N/A	N/A	N/A	Survey	Survey	Survey		
Seringapatam Reef, Scott Reef and Sandy Islet (submerged receptor, with exception of small sand islet)	Priority survey	Priority survey	Priority survey	Priority survey	Survey	Priority survey	Survey	Survey		

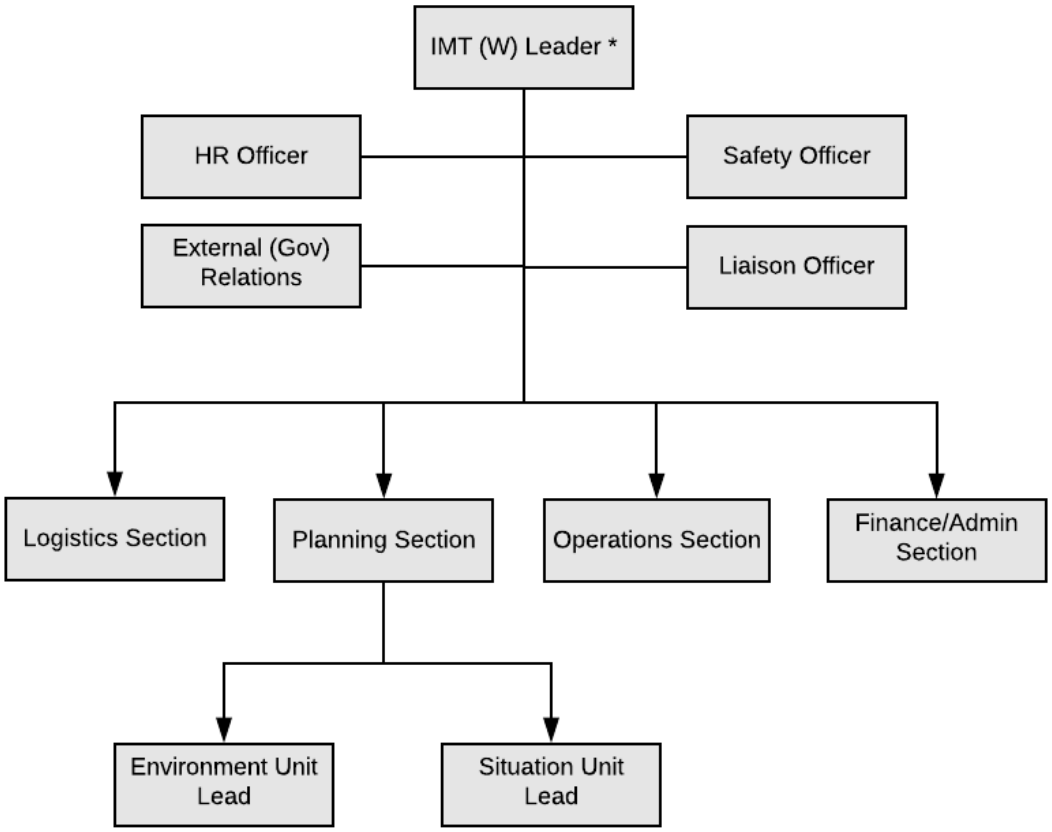
Location	SMP									
	Water quality impact assessment	**Sediment quality impact assessment**	**Intertidal and coastal habitat assessment**	**Seabirds and shorebirds**	**Marine mega-fauna assessment - reptiles**	**Marine mega-fauna assessment - whale sharks, dugong and cetaceans**	**Benthic habitat assessment**	**Marine fish assemblages assessment**	**Fisheries impact assessment**	**Heritage and social impact assessment**
Ashmore Reef (emergent receptor)	Priority survey	Priority survey	Priority survey	Priority survey	Priority survey	Priority survey	Survey	Priority survey		

5 OSM Organisational Structure

Shell uses the Incident Command System (ICS) to respond to incidents and therefore adopts the key roles and responsibilities used in this system, as described in the activity EPs and/or OPEPs. The Shell Australia Incident Management Team West (IMT (W)) will be responsible for coordinating OSM activities, which will be led by the Planning Section within the IMT, with support from each Section, in particular the Operations Section.

The Shell IMT (W) structure is shown in Figure 5-1. Where the Western Australian Department of Transport is the Control Agency, the IMT (W) will be managed through coordinated command and Shell will still be expected to continue monitoring activities in State waters, with oversight from DoT.

Figure 5-2 illustrates the structure of the OSM Management Team during the response phase. The IMT (W) Incident Commander is ultimately accountable for managing the response operation, which includes this plan. Depending on the scale of the event, individual people may perform multiple roles; similarly, multiple people may share the same role.



* In Level 2 and 3 spills where DoT is activated as the Control Agency for State waters response, the IMT (W) will be managed through coordinated command (DoT is Control Agency in State waters, Shell is Control Agency in Commonwealth waters)

Figure 5-1: Shell IMT (W) Structure

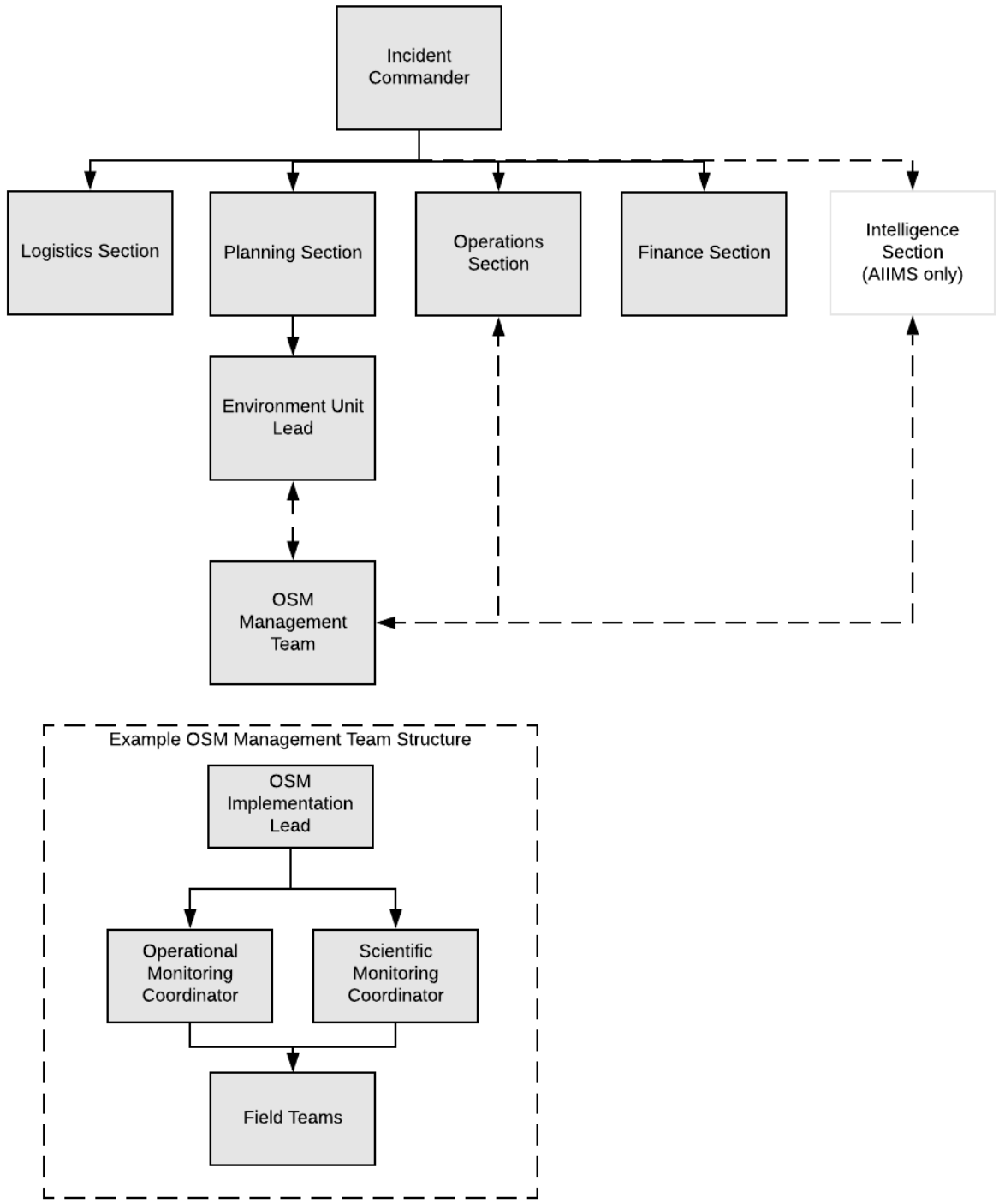


Figure 5-2: Shell IMT (W) Structure with OSMP Team

6 OSM Roles and Responsibilities

OSM roles and responsibilities are listed in Section 10.13.2 of the Joint Industry OSM Framework. Table 6-1 outlines the roles help by Shell and the OSM Service Provider.

During the post-response phase, the Shell Environment Advisor and the OSM Services Provider OSM Implementation Lead will continue to be responsible for the coordination and delivery of monitoring plans.

Table 6-1: Roles and Responsibilities – Shell OSMP

Role	Key Responsibilities
IMT (W) Leader (Shell)	Ultimately accountable for the implementation of the OSMP. Specific responsibilities related to the OSMP include: • Ensure OSMP-specific roles are established • Integrate operational and scientific monitoring with the spill response • Ensure that OMP and SMP components are implemented according to their specific initiation criteria and within nominated response times • Ensure that the OSMP Implementation Lead and Environment Unit Lead are sufficiently resourced to oversee and guide implementation of OSMP activities
Environment Unit Lead (EUL) (Shell)	The EUL is the key position for relaying information between the IMT and the OSMP Implementation Lead. Key OSMP responsibilities include: • Mobilise OSMP Service Provider • Validate protection and monitoring priorities • Validate strategic SIMA to generate the initial operational SIMA • Main point of contact between IMT and OSMP Service Provider • Provide overarching technical advice • Analysing data received from monitoring teams (this task may be delegated to OSMP Management Team) and ensuring the information is incorporated into the current/next operating period's Incident Action Plan • Advise on environmental impact from implementing monitoring • Management of scientific monitoring components once spill response operation is terminated
Situation Unit Lead (SUL) (Shell)	The SUL is the key position for receiving data from monitoring teams and disseminating it to the relevant team within the IMT.
OSMP Implementation Lead (Shell or OSMP Monitoring Provider/s)	Responsible for overseeing implementation of OMP and SMP components in accordance with this Plan, specifically identify: • The relevant OMP and SMP components that may be triggered based on the information collected during the initial response and OMP monitoring • Implementation of response options to ensure that the relevant OMP and SMP components are implemented at the appropriate times • Liaise with Shell Environment Advisor for advice on scientific monitoring components • Approve sampling and analysis plans for the SMP components within the nominated time frame of the SMP component being triggered • Ensure mobilisation of resources for sampling and analysis plans within the nominated time frame of the SMP component being triggered

Role	Key Responsibilities
	• Liaise with relevant stakeholders and regulators on monitoring design, monitoring priorities, and results
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSMP Service Provider/s)	The Operational Monitoring Coordinator and Scientific Monitoring Coordinator are the technical leads for each monitoring type. Responsibilities include: • Finalise monitoring design for individual OMPs and/or SMPs • Understand the data metrics collected in the event of a spill • Advise the OSMP Implementation Lead on data collection, logistical support required, and monitoring priorities if constraints (e.g. safety, time, logistics) are encountered • Oversee data analyses and interpretation • Manage data, including spatial data • Present data in an appropriate and informative format to allow for timely decisions
OSMP Field Operations Manager (OSMP Service Provider/s)	Responsible of the coordination of resources and developing a schedule of movements, in close consultation with the IMT Logistics Section. Key responsibilities include: • Determine locations where monitoring teams are required and resource requirements for specific locations • Keep track of vessel/aerial movements associated with monitoring activities • Monitor resource availability • Direct communications with relevant Monitoring Coordinator and Field Team Leads • Monitor and coordinate simultaneous operations
OSMP Field Teams (OSMP Service Provider/s)	A Field Team includes one Field Team Lead, who is the key contact point to the relevant Monitoring Coordinator during a field deployment. The responsibilities of all Field Team members include: • Understand the details of monitoring methods • Ensure that they are supplied with adequate equipment and field data collection sheets to undertake the monitoring component • Ensure awareness and understanding of QA/QC procedures • Help with report preparation if required
Environment Advisor (Shell)	Oversight of scientific monitoring components both during and post-response

7 Mobilisation and Timing of OMP and SMP implementation

The time it takes to mobilise and implement each OMP and SMP will vary according to the spill risk profile, proximity of the spill to sensitive receptors, mobilisation constraints and logistical requirements. Table 7-1 provides an indicative implementation schedule for OMP and SMPs in the EMBA and adjacent waters. The locations listed are aligned to the initial monitoring priorities described in Section 2.

Note: 'Initiation' means that the monitoring plan has been triggered and the IMT/Monitoring Provider has commenced finalisation of the plan including implementation of the following actions (which may take 48-72 hours to complete all actions):

- Activate internal OSMP personnel and external contracts
- Select/confirm sites
- Finalise sampling technique
- Determine suitable sampling frequency
- Finalise standard operating procedures
- Allocate number of teams, personnel, equipment and supporting resource requirements
- Finalise Health, Safety and Environment (HES) documentation prior to mobilisation of field teams
- Confirm logistics (e.g. flights, accommodation, vessels)
- Commence deployment of field teams.

For SMPs:

- Gather existing baseline data and/or establish control/reference sites
- Establish benchmarks and guidelines to be used
- Confirm indicator species
- Confirm parameters and metrics.

Table 7-1: Indicative OMP and SMP implementation schedule for Shell OSMP activities

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks

Spill site and immediate surrounding waters	OM	Initiation of:
		• OMP: Air quality modelling (responder health and safety)
		• OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)
			Initiation of:
			• OMP: Oil properties and weathering behaviour at sea
			• OMP: Water quality assessment
			• OMP: Sediment Quality Assessment
			• OMP: Surface chemical dispersant effectiveness and fate (surface and subsurface)
			• OMP: Marine fauna assessment
			  ○ Seabirds and shorebirds
			  ○ Fish
				As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met

	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Seabirds and shorebirds • SMP: Marine mega-fauna assessment - whale sharks, dugongs and cetaceans	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			• SMP: Marine fish and elasmobranch assemblages assessment		
Browse Island	OM	Initiation of: • OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)	Initiation of: • OMP: Oil properties and weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment ○ Reptiles ○ Seabirds and shorebirds ○ Fish	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met
	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment -	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat assessment • SMP: Seabirds and shorebirds • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment		

Cartier Island	OM	Initiation of:
		• OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)
			Initiation of:
			• OMP: Oil properties and weathering behaviour at sea
			• OMP: Water quality assessment
			• OMP: Sediment quality assessment
			• OMP: Shoreline clean-up assessment technique (SCAT)
			• OMP: Marine fauna assessment
			  ○ Reptiles
			  ○ Dugongs
				As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			○ Seabirds and shorebirds ○ Fish		
	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment - whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat assessment • SMP: Seabirds and shorebirds • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
Echuca and Heywood Shoal	OM	Initiation of: • OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)	Initiation of: • OMP: Oil properties and weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Marine fauna assessment ○ Fish	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met
	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met
Seringapatam Reef, Scott Reef and Sandy Islet	OM	Initiation of: • OMP: Pre-emptive assessment of sensitive receptors	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and	Initiation of: • OMP: Oil properties and weathering behaviour at sea	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks

		at risk (desktop only)	used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	• OMP: Water quality assessment
				• OMP: Sediment quality assessment
				• OMP: Marine fauna assessment
				  ○ Reptiles
				  ○ Seabirds and shorebirds
				  ○ Fish
					used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met

	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Seabirds and shorebirds • SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment - whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Benthic habitat assessment	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			• SMP: Commercial and recreational fisheries impact assessment • SMP: Social impact assessment		

Ashmore Reef	OM	Initiation of:
		• OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)
			Initiation of:
			• OMP: Oil properties and weathering behaviour at sea
			• OMP: Water quality assessment
			• OMP: Sediment quality assessment
			• OMP: Shoreline clean-up assessment technique (SCAT)
			• OMP: Marine fauna assessment
			  ○ Reptiles
			  ○ Dugongs
			  ○ Seabirds and shorebirds
			  ○ Fish
				As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met

	SM	Commence activation and mobilisation process Activation of SMP Team Leads	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			• SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment - whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat assessment • SMP: Seabirds and shorebirds • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment • SMP: Social impact assessment		
Buccaneer Archipelago	OM	Initiation of: • OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or	Initiation of: • OMP: Oil properties and weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment OMP: Shoreline	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			reallocated according to the specifics of the actual spill until termination criteria are met	clean-up assessment technique (SCAT) • OMP: Marine fauna assessment ○ Reptiles ○ Dugongs ○ Seabirds and shorebirds ○ Fish	reallocated according to the specifics of the actual spill until termination criteria are met
	SM	Commence activation and mobilisation process Activation of SMP Team Leads and finalisation of SMPs	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment - whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat assessment • SMP: Seabirds and shorebirds	Continue SMP monitoring until termination criteria are met	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
			• SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment • SMP: Social impact assessment		
Indonesian Boundary	OM	Initiation of: • OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met	Initiation of: • OMP: Oil properties and weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment ○ Reptiles ○ Dugongs ○ Seabirds and shorebirds ○ Fish	As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met
	SM	n/a	Commence activation and mobilisation process Activation of SMP Team Leads and finalisation of SMPs	Initiation of: • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment	Continue SMP monitoring until termination criteria are met

Location	Monitoring Type	0-48 hours	2-4 days	5-10 days	2 weeks
				• SMP: Marine mega-fauna assessment - reptiles • SMP: Marine mega-fauna assessment -whale sharks, dugongs and cetaceans • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat assessment • SMP: Seabirds and shorebirds • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment • SMP: Social impact assessment	

8 Resource Requirements

The resources required to assist the IMT in the coordination and management of OSM are outlined in Table 8-1. The resources required to implement operational and scientific monitoring components are presented in Table 8-1 and Table 8-2 respectively, which is based on the monitoring priorities in Section 2 and implementation schedule outlined in Table 7-1. To demonstrate resource requirements this assessment is based on the vessel collision scenario (FLNG storage tank) of Prelude Condensate (42,000 m^3 over 2 hours). It should be noted that a single spill will not contact all locations and receptors listed in Table 7-1.

Table 8-1: Resources required for key OSM coordination roles

Role	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
OSMP Implementation Lead (Shell or OSMP Monitoring Provider/s)	1 x Principal Scientist	1 x Principal Scientist	1 x Principal Scientist	Environmental service provision in place for the duration of activities
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSMP Service Provider/s)	2 x Principal Scientist	2 x Principal Scientist	2 x Principal Scientist	
OSMP Field Operations Manager (OSMP Service Provider/s)	1 x Senior Scientist	1 x Senior Scientist	1 x Senior Scientist	

Table 8-2: Resources required for implementing operational monitoring plans

OMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
Hydrocarbon properties and weathering behaviour at sea*	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal)	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet)	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement

OMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
	Total 4 team leaders and 8 team members (3 per team)	Total 5 team leaders and 10 team members (3 per team) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	1 team (Buccaneer Archipelago) 1 teams (Indonesian Boundary) Total 7 team leaders and 14 team members (3 per team) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	
Pre-emptive assessment of sensitive receptors at risk (desktop only)	1 team (all sites)	1 team (all sites)	1 team (all sites)	Environmental service provision in place for the duration of activities
Shoreline clean-up assessment technique (SCAT)	1 team (Browse Island) 1 team (Cartier Island) 1 team (Ashmore Reef) Total 3 team leaders and 6 team members (3 per team)	1 team (Browse Island) 1 team (Cartier Island) 1 team (Ashmore Reef) 2 teams (Indonesian Boundary) Total 5 team leaders and 10 team members (3 per team)	1 team (Browse Island) 1 team (Cartier Island) 1 team (Ashmore Reef) 3 teams (Indonesian Boundary) 1 team (Buccaneer Archipelago) Total 7 team leaders and 14 team members (3 per team)	Environmental service provision in place for the duration of activities AMOSC (AMOSPlan) OSRL Master Services Agreement DoT and AMSA Marine contractors
Surface chemical dispersant effectiveness and fate	1 team leader 1 team member (for visual observations, which may be performed by trained aerial observers used during	1 team leader 1 team member (for visual observations, which may be performed by trained aerial observers used during	1 team leader 1 team member (for visual observations, which may be performed by trained aerial observers used during	AMOSC and OSRL Agreements Environmental service provision in place for the

OMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
	monitor and evaluate if trained in observation and verification of chemical dispersant effectiveness) For water quality observations, refer to OMP: Water quality assessment	monitor and evaluate if trained in observation and verification of chemical dispersant effectiveness) For water quality observations, refer to OMP: Water quality assessment Additional team/s (various locations as required)	monitor and evaluate if trained in observation and verification of chemical dispersant effectiveness) For water quality observations, refer to OMP: Water quality assessment Additional team/s (various locations as required)	duration of activities Marine contractors
Subsea dispersant injection monitoring	No subsea dispersant injection until week 2 due to transportation requirements	12 hour/day operation 1 team leader/operations manager 11 team members 24 hour/day operation 2 team leaders/operations manager 16 team members	12 hour/day operation 1 team leader/operations manager 11 team members 24 hour/day operation 2 team leaders/operations manager 16 team members	OSRL Subsea Well Intervention Service (SWIS) Capping Stack Membership
Water quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites) Additional teams, if required (dependent upon any modifications to sampling locations, frequency etc.)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	Environmental service provision in place for the duration of activities Marine contractors

OMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
			Additional teams, if required (dependent upon any modifications to sampling locations, frequency etc.)	Laboratory arrangement
Marine fauna assessment	1 team to conduct initial aerial surveys for spill site, Browse Island, Ashmore Reef, Cartier Island, Echuca Shoal and Heywood Shoal (2 observers per aircraft) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	If vessel based surveys selected: 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca and Heywood Shoal) 2 teams (Indonesian Boundary) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) Total 6 team leaders and 6 team members (2 per team) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	If vessel based surveys selected: 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca and Heywood Shoal) 2 teams (Indonesian Boundary) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) 1 team (Buccaneer Archipelago) Total 7 team leaders and 7 team members (2 per team) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	Environmental service provision in place for the duration of activities Aviation contractors Marine contractors
Air quality modelling (responder health and safety)	1 team (all sites)	1 team (all sites)	1 team (all sites)	Shell in-house personnel

**Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment*

Table 8-3: Resources required for implementing scientific monitoring plans

SMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
Water quality impact assessment	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) Total 4 team leaders and 8 team members (3 per team) Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) Total 5 team leaders and 10 team members (3 per team) Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) 1 team (Buccaneer Archipelago) 1 teams (Indonesian Boundary) Total 7 team leaders and 14 team members (3 per team)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)	Refer to SMP: Water quality impact assessment* (all sites)	Refer to SMP: Water quality impact assessment* (all sites)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Intertidal and coastal habitat assessment	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef)	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef)	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef)	Environmental service provision in place for the duration of activities Marine contractors

SMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
	Total 2 team leaders and 2 team members (2 per team)	2 teams (Indonesian Boundary) Total 4 team leaders and 4 team members (2 per team)	3 teams (Indonesian Boundary) 1 team (Buccaneer Archipelago) Total 6 team leaders and 6 team members (2 per team)	
Seabirds and shorebirds	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) Total 2 team leaders and 2 team members (2 per team) Note: can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) 2 teams (Indonesian Boundary) Total 5 team leaders and 5 team members (2 per team)	1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 3 teams (Indonesian Boundary) 1 team (Buccaneer Archipelago) Total 6 team leaders and 6 team members (2 per team)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Marine mega-fauna assessment ○ Reptiles ○ Whale sharks ○ Dugongs	2 teams (spill site and surrounds) 2 teams (Browse Island) 2 teams (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal)	2 teams (spill site and surrounds) 2 teams (Browse Island) 2 teams (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal)	2 teams (spill site and surrounds) 2 teams (Browse Island) 2 teams (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement

SMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
○ Cetaceans	Total 7 team leaders and 21 team members (4 per team) Note: can initially be performed by the same team as the relevant OMP: Marine fauna assessment. This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	2 teams (Seringapatam Reef, Scott Reef, Sandy Islet) Total 9 team leaders and 27 team members (4 per team)	2 teams (Seringapatam Reef, Scott Reef, Sandy Islet) 1 team (Buccaneer Archipelago) 1 team (Indonesian Boundary) Total 11 team leaders and 33 team members (4 per team)	
Benthic habitat assessment	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) Total 4 team leaders and 8 team members (3 per team)	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) Total 5 team leaders and 10 team members (3 per team)	1 team (spill site and surrounds) 1 team (Browse Island) 1 team (Cartier Island and Ashmore Reef) 1 team (Echuca Shoal & Heywood Shoal) 1 team (Seringapatam Reef, Scott Reef, Sandy Islet) 1 team (Buccaneer Archipelago) 1 teams (Indonesian Boundary) Total 7 team leaders and 14 team members (3 per team)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Marine fish and elasmobranch assemblages assessment	1 team (Cartier Island and Ashmore Reef and associated KEF)	1 team (Cartier Island and Ashmore Reef and associated KEF)	1 team (Cartier Island and Ashmore Reef and associated KEF)	Environmental service provision in place for the duration of activities Marine contractors

SMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
	1 team (Echuca Shoal & Heywood Shoal) 1 team (Continental Slope Demersal Fish Communities KEF) Total 3 team leaders and 6 team members (3 per team) Note: can initially be performed by the same team as OMP: Marine fauna assessment – fish. This SMP may replace OMP: Marine fauna assessment – fish if the OMPs termination criteria are triggered	1 team (Echuca Shoal & Heywood Shoal) 1 team (Continental Slope Demersal Fish Communities KEF) 1 team (Seringapatam Reef and Commonwealth waters in the Scott Reef Complex KEF) 1 team (Mermaid Reef and Commonwealth waters surrounding Rowley Shoals KEF) Total 5 team leaders and 10 team members (3 per team)	1 team (Echuca Shoal & Heywood Shoal) 1 team (Continental Slope Demersal Fish Communities KEF) 1 team (Seringapatam Reef and Commonwealth waters in the Scott Reef Complex KEF) 1 team (Mermaid Reef and Commonwealth waters surrounding Rowley Shoals KEF) 1 team (Buccaneer Archipelago) 1 team (Indonesian Boundary) Total 7 team leaders and 14 team members (3 per team)	Laboratory arrangement
Fisheries impact assessment	2 teams (Commonwealth fisheries with the potential to be impacted/are being impacted Total 2 team leaders and 4 team members (3 per team) Note: can initially be performed by the same team as OMP: Marine fauna assessment – fish. This SMP may replace OMP: Marine fauna assessment – fish if	3 teams (Commonwealth fisheries with the potential to be impacted/are being impacted Total 3 team leaders and 6 team members (3 per team)	4 teams (Commonwealth fisheries with the potential to be impacted/are being impacted Total 4 team leaders and 8 team members (3 per team)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement

SMP	Week 1 (total)	Week 2 (total)	Week 3 (total) onwards	Arrangement
	the OMPs termination criteria are triggered			
Heritage features assessment	1 team Total 1 team leader and 2 team members (3 per team)	1 team Total 1 team leader and 2 team members (3 per team)	1 team Total 1 team leader and 2 team members (3 per team)	Environmental service provision in place for the duration of activities Marine contractors Laboratory arrangement
Social impact assessment	1 team Total 1 team leader and 2 team members (3 per team)	1 team Total 1 team leader and 2 team members (3 per team)	1 team Total 1 team leader and 2 team members (3 per team)	Shell in-house personnel (e.g. Social Performance Team)

9 Capability arrangements

Shell has currently contracted an environmental service provider to provide standby OSMP response and implementation services, which includes lead contract, logistics and reporting.

Details of OSMP services are provided in

In addition, Shell is a Capping Member of OSRL's Subsea Well Intervention Service (SWIS), enabling access to trained personnel and specialised monitoring equipment for subsea dispersant injection monitoring.

Table 9-1. Shell will maintain responsibility for implementing OMP: Air quality modelling (responder health and safety) and SMP: Social Impact Assessment.

The OSMP Services Provider is contracted to provide Shell with a monthly Standby Capability and Competency Report, which details personnel requirements for OMPs/SMPs, numbers of available personnel and competencies for service provider and sub-contracted personnel.

In addition, Shell is a Capping Member of OSRL's Subsea Well Intervention Service (SWIS), enabling access to trained personnel and specialised monitoring equipment for subsea dispersant injection monitoring.

Table 9-1: Shell Australia's current OSMP services provider standby and implementation services

Standby	Implementation
24/7 monitoring support accessed through 24 hr. call out number	Provision of an OSMP Implementation Lead and Scientific Logistics Coordinator to the Shell IMT within 12 hours of notification
Provision of a suitably trained personnel, which includes support from Astron and Curtin University of Technology	Provision of a first-strike scientific team within 24 hours of notification, available in Perth and ready to deploy
Monthly reports on personnel and equipment availability	Development of scientific response and sampling plans (based on modelled hydrocarbon spill scenario)
Access to the service providers global network of scientific and engineering consulting expertise	Provision of a second-strike scientific team within 72 hours of notification, available in Perth and ready to deploy
Access to the service providers local network of terrestrial consultants, laboratories and field service providers	Priority access to the service providers staff and equipment

9.1 Personnel competencies

Shell's OSM Service Contract specifies the competency requirements for key OSM personnel.

Table 9-2 outlines the required competencies of key OSMP roles for Shell and its OSMP service providers. Shell will, where practicable, engage its most qualified local environmental advisors in the initial stages of the monitoring program to help activate and mobilise monitoring teams and work with the OSMP Services Provider to finalise monitoring designs. Personnel selected for contracted OSMP standby services are competent personnel with considerable experience in various monitoring roles.

Availability of personnel will be listed in the OSMP Service Provider's Standby Capability and Competency Report. Personnel listed on the monthly update will be contactable via mobile phone during this period and accessible to Perth airport or another suitable port within 48 hours of Shell's initial activation of OSMP Services.

Table 9-2: Key OSMP roles and competencies

Role	Competencies
Environment Unit Lead[1]	• Bachelor degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • > 10 years' experience in environmental management • PMAOMIR320 – Manage Incident Response Information or ICS 100 and ICS 200 or AMOSC IMO2 Oil Spill Management Course. • Participation in one incident management exercise every two years • Operational and Scientific Monitoring Plan Awareness Training
OSMP Implementation Lead (Shell or OSMP Services Provider)	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • > 10 years' experience in environmental management • Familiarity with Shell Health, Security, Safety, Environment and Social Performance Management Framework • PMAOMIR320 – Manage Incident Response Information or ICS 100 and ICS 200 or AMOSC IMO2 Oil Spill Management Course • Participation in one incident management exercise per year • Operational and Scientific Monitoring Plan Awareness Training, including understanding of how to activate external OSMP providers
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSMP Services Provider)	• Bachelor degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • > 5 years' experience in environmental management • PMAOMIR320 – Manage Incident Response Information or ICS 100 and ICS 200. • Participation in one incident management exercise per year • Operational and Scientific Monitoring Plan Awareness Training

[1] If the appointed Environment Unit Lead does not meet this competency requirement, then for OSMP decision making and implementation they must be supported by another person who does meet this level of competency and can sign off each Operational and Scientific Monitoring IAP. This may include someone appointed via Monitoring Service Provider or mutual aid (e.g. another Titleholder).

	• Working knowledge of processes to engage additional support contracts and personnel (if required)
OSMP Field Operations Manager (OSMP Services Provider)	• Bachelor degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >5 years' experience in relevant scientific field
OSMP Field Teams (OSMP Services Provider)	• Refer to OMPs and SMPs

In addition and where practicable, Shell will engage its most qualified local environmental advisors in the initial stages of the monitoring program to help activate and mobilise monitoring teams and support the OSM Services Provider in the finalisation of monitoring designs.

9.2 Equipment

Equipment requirements are listed in the individual OMPs and SMPs. A generalised breakdown of equipment types and the source is listed in Table 9-3.

In accordance with the OSM services contract, the OSM Services Provider will provide all specialised field monitoring equipment to implement individual OMPs and SMPs. Shell will remain responsible for support and field logistics, including monitoring platforms (e.g. vessels, vehicles and aircraft), flights and accommodation for personnel and transportation/couriers for samples to be sent back to laboratories.

Availability of field equipment will be listed in the OSM Services Provider's Standby Capability and Competency Report.

Table 9-3: OSMP Equipment

Equipment type	Source
Desktop equipment (e.g. Oil Spill Response Atlas, GIS)	Coordinated through IMT (W) Geomatics Team
In-field specialised monitoring equipment (e.g. fluorometers, sample bottles, ROVs)	Coordinated through the OSMP Services Provider's standby OSMP response and implementation services Specialised subsea monitoring equipment available through OSRL SWIS Capping Membership
Logistical equipment (e.g. in-field accommodation, vessels, aircraft)	Refer to Browse Regional OPEP HSE_GEN_016765

9.3 Exercises

Shell Australia maintains an Exercise and Training Schedule as detailed in the Shell Australia Emergency Management Manual (HSE_GEN_010996) to ensure its competency in responding to and managing major incidents, including oil spills. The Exercise and Training Schedule is reviewed and revised (if required) annually.

As part of this schedule, Shell conducts a number of different exercise types that may include a component of operational and scientific monitoring, which are outlined in Table 9-4.

Table 9-4: Exercise types

Exercise Type	Description	Frequency
Notification exercise	Test procedures to notify and activate the IMT, oil spill response organisations, third party providers (including OSMP contractors) and regulators	At least annually
Tabletop exercise	Normally involves interactive desktop discussions of a simulated scenario. OSMP tabletop exercises may involve the following focus areas: • Test the time required to finalise monitoring design; • Test arrangements for delivery and use of data by IMT in decision making; or • Data exchange test with field (opportunistic when contractors in the field)	As per Shell Australia's Exercise and Training Schedule
Incident Management Exercise	Involves IMT activation to establish command, control, and coordination of a Level 2 or 3 incident. Can simulate several different aspects of an oil spill incident and may involve third parties. OSMP activation may be included as component of this exercise.	As per Shell Australia's Exercise and Training Schedule

The purpose of this testing is to confirm that the response arrangements and capability in place is available when needed and function as intended. As part of the exercise process, Shell prepares a number of documents to ensure drills and exercises are well planned, conducted and evaluated. To support this, the following documents are used for Level 2-3 exercises:

- Exercise Scope Document – provides background context to the exercise, outlines the exercise need, aim, objectives, details of the scenario, participating groups and agencies, exercise deliverables and management structure. This document can be used to engage a third-party contractor to assist in conducting the exercise
- Exercise plan and instructions – provide instructions and 'play' (including any injects) for conducting the exercise
- Post exercise report – includes an after-action review of the exercise, evaluating how the exercise performed against meeting its aim and objectives.

Shell routinely undertakes post-exercise debriefings following Level 2-3 exercises and drills to identify opportunities for improvement and communicate lessons learned. Actions that are derived from drills and exercises including debriefs are documented in an action tracking system.

Shell annually tests its standby arrangements and activation process with its OSMP contractors, to ensure Shell IMT roles and key OSMP Services Provider personnel are familiar with the activation process and to check the OSMP Services Provider's Standby Capability and Competency Report.

Shell incorporates OSMP activation and planning into at least one tabletop or incident management exercise each year.

10 Capability Assessment

10.1 Operational monitoring

OMP: Hydrocarbon properties and weathering behaviour at sea

Teams shall consist of one team lead and two team members. Initially teams may also conduct sampling for OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment. This arrangement would rely upon suitable transportation arrangements for samples so that the sampling vessels can remain in-field.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Pre-emptive assessment of sensitive receptors at risk (desktop only)

Teams shall consist of one to two personnel, who may also be able to fulfil other desktop based assessments or analysis. This monitoring component will rely upon GIS specialist personnel (from existing Shell Geomatics Team) to input data into relevant software.

OMP: Shoreline clean-up assessment technique (SCAT)

SCAT shall consist of three members per team, including one team lead, which should to be able to cover 8-10 km per day. This distance may be more, especially if unmanned aerial vehicles (UAVs) are employed to cover shorelines that have access limitations. Shell has used the modelling data in Section 2 to plan worst case shoreline and habitat assessment personnel requirements. Team leaders will be sourced from Shell's OSMP Services Provider and supported by personnel from AMOSC and OSRL and will be trained in shoreline assessment techniques. Team members can include personnel who have completed basic training prior to mobilisation.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Surface chemical dispersant effectiveness and fate

Initially, the water quality monitoring component may be conducted by the same team undertaking OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Water quality assessment and OMP: Sediment quality assessment. Depending upon the nature and scale of the spill, and as resources are scaled, a dedicated sampling team may be deployed.

Sampling teams shall consist of two to three personnel trained in the observation and verification of chemical dispersant effectiveness. It is difficult to quantify the number of teams that would be required to implement this monitoring program, although one team could assess multiple locations. A suitable sampling vessel would be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Subsea dispersant injection monitoring

Water quality monitoring would need to commence prior to the use of subsea dispersant injection. Shell will access capability via its OSRL Subsea Well Intervention Service (SWIS) Capping Stack Membership, which can provide a dedicated sampling team with deepwater sampling and monitoring equipment.

Vessels and remote accommodation are required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Water quality assessment

Initially, this monitoring component may be conducted by the same team undertaking OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate and OMP: Sediment quality assessment.

Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Sediment quality assessment

Initially, this monitoring component may be conducted by the same team undertaking OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate and OMP: Water quality assessment. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Marine fauna assessment

Initially, monitoring for all relevant marine fauna groups may be conducted via aerial surveys. Depending on the nature and scale of the spill, this could be conducted by the same platform conducting aerial surveillance of the slick. However, trained marine fauna aerial observers would be required to undertake the assessment, which may mean additional personnel on each aircraft (unless personnel with a dual skill set in marine fauna aerial observation and aerial spill surveillance are available).

Aerial surveys provide a rapid and resource efficient method of collecting marine fauna assessment data, however, they do not enable the collection of detailed observations. If aerial surveys require validation then this may be performed via vessel based surveys and/or SCAT teams.

Aircraft will be sourced via Shell's existing aviation contracts. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

OMP: Air quality modelling (responder health and safety)

Teams shall consist of one to two personnel, who may also be able to fulfil other desktop based assessments or analysis. This monitoring component will rely upon Shell in-house air quality specialists.

10.2 Scientific monitoring

SMP: Water quality impact assessment

Initially, this monitoring component may be conducted by the same team undertaking OMP: Water quality assessment or this SMP may replace OMP: Water quality assessment if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Sediment quality impact assessment

Initially, this monitoring component may be conducted by the same team undertaking OMP: Sediment quality assessment or this SMP may replace OMP: Sediment quality assessment if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Intertidal and coastal habitat assessment

Teams will consist of two members per team, including one team lead. Shell has used the modelling data in Section 2 to estimate the initial personnel requirements to undertake this sampling. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Seabirds and shorebirds

Initially, this monitoring component may be conducted by the same team undertaking OMP: Marine fauna assessment – seabirds and shorebirds or this SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Aircraft will be sourced via Shell's existing aviation contracts. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Marine mega-fauna assessment – Reptiles

Initially, this monitoring component may be conducted by the same team undertaking OMP: Marine fauna assessment – reptiles or this SMP may replace OMP: Marine fauna assessment – reptiles if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Aircraft will be sourced via Shell's existing aviation contracts. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Marine mega-fauna assessment – Whale sharks, Dugongs and/or Cetaceans

Initially, this monitoring component may be conducted by the same team undertaking the relevant OMP: Marine fauna assessment or this SMP may replace the relevant OMP: Marine fauna assessment if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Aircraft will be sourced via Shell's existing aviation contracts. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Benthic habitat assessment

Teams will consist of 3 members per team, including one team lead. Shell has used the modelling data in Section 2 to estimate the initial personnel requirements to undertake this sampling. Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Marine fish assemblages assessment

Initially, this monitoring component may be conducted by the same team undertaking the relevant OMP: Marine fauna assessment or this SMP may replace the relevant OMP: Marine fauna assessment if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Fisheries impact assessment

Initially, this monitoring component may be conducted by the same team undertaking the relevant OMP: Marine fauna assessment or this SMP may replace the relevant OMP: Marine fauna assessment if the relevant termination criteria are triggered. Depending upon the nature and scale of the spill, a dedicated sampling team may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Heritage features assessment

Initially, this monitoring component may be conducted by the same team undertaking SMP: Benthic habitat assessment if sampling locations and workloads permit. Depending upon the nature and scale of the spill, a dedicated sampling team with marine archaeology subject matter experts may be deployed for this monitoring component.

Vessels and remote accommodation may be required to implement this monitoring component. These will be sourced from existing contracts Shell has with marine contractors.

SMP: Social impact assessment

This team shall consist of three personnel, who may be required to conduct the assessment in-field and/or via desktop based assessments or analysis. This monitoring component will rely upon Shell in-house social impact assessment specialists and, if additional resources are required Shell has established contracts in place with consultants with social impact assessment subject matter experts.

Table 10-1: Shell OSMP Capability

Component	Total Personnel Required (Weeks 1-2)[2]	Personnel available via Environmental Service Contract	Personnel available via OSROs	Shell	Total Personnel Available
OSMP Personnel embedded in Shell IMT	1 OSMP Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 1 Field Operations Manager	1 OSMP Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 1 Field Operations Manager	N/A	1 OSM Implementation Lead (initial)	1 OSMP Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 1 Field Operations Manager
OMPs					
Hydrocarbon properties and weathering behaviour at sea*	5 team leaders 10 team members	5 team leaders 10 team members	N/A	N/A	5 team leaders 10 team members
Pre-emptive assessment of sensitive receptors at risk (desktop only)	1 team member 1 GIS Specialist	1 team member	N/A	2 GIS Specialists	2 GIS Specialists 1 Team member
Shoreline clean-up assessment technique (SCAT)	5 team leaders 10 team members	13 team leaders 24 team members	13 team leaders (AMOSC) 12 team leaders (OSRL)	N/A	38 team leaders 24 team members
Surface chemical dispersant effectiveness and fate	Visual observations: 1 team leader 1 team member Water quality assessment – refer to	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea	Visual observations: 3 team leaders 4 team members	N/A	Visual observations: 3 team leaders 4 team members

[2] If additional resources are required for week 3 onwards then this will be identified early in the monitoring process and Shell will activate additional contracted resources through its OSMP Services Provider to increase capacity

Component	Total Personnel Required (Weeks 1-2)[2]	Personnel available via Environmental Service Contract	Personnel available via OSROs	Shell	Total Personnel Available
	SMP: Water quality assessment				
Subsea chemical dispersant injection monitoring	18 specialist personnel for 24 hour operation	N/A	18 specialist personnel available through OSRL sub-contracts	N/A	18 specialist personnel available through OSRL sub-contracts
Water quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea				
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea				
Marine fauna assessment	1 aerial team (including 1 Marine Mammal Observer (MMO) and 1 Aerial survey observer) 6 vessel teams (including 1 vessel-based survey trained MMO, 1 experienced vessel survey observer per team)	16 MMOs 11 Aerial survey observers 21 vessel survey observers 6 experienced ornithologists 2 personnel with pathology or veterinary skills	N/A	N/A	16 MMOs 11 Aerial survey observers 21 vessel survey observers 6 experienced ornithologists 2 personnel with pathology or veterinary skills
Air quality modelling (responder health and safety)	1 Air Quality Specialist			1 Air Quality Specialist Specialists from Project and Technology Team (Shell Global)	1 Air Quality Specialist Specialists from Project and Technology Team (Shell Global)
SMPs					
Water quality impact assessment	Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered				

Component	Total Personnel Required (Weeks 1-2)[2]	Personnel available via Environmental Service Contract	Personnel available via OSROs	Shell	Total Personnel Available
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)				
Intertidal and coastal habitat assessment	4 team leaders 4 team members	12 team leaders 21 team members	N/A	N/A	12 team leaders 21 team members
Seabirds and shorebirds	Note: can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered				
Marine mega-fauna assessment	Note: can initially be performed by the same team as OMP: Marine fauna assessment. This SMP may replace OMP: Marine fauna assessment if the OMPs termination criteria are triggered				
Benthic habitat assessment	5 team leaders 10 team members	5 team leaders 10 team members	N/A	N/A	5 team leaders 10 team members
Marine fish and elasmobranch assemblages assessment	5 team leaders 10 team members	2 senior marine scientists trained in fish identification and necropsy 9 scientists with fish survey and ROV/BRUV experience 7 team members	N/A	N/A	2 senior marine scientists trained in fish identification and necropsy 9 scientists with fish survey and ROV/BRUV experience 7 team members
Fisheries impact assessment	3 team leaders 6 team members	2 senior marine scientists trained in fish identification and necropsy 9 scientists with fish survey and ROV/BRUV experience 7 team members	N/A	N/A	2 senior marine scientists trained in fish identification and necropsy 9 scientists with fish survey and ROV/BRUV experience 7 team members

Component	Total Personnel Required (Weeks 1-2)[2]	Personnel available via Environmental Service Contract	Personnel available via OSROs	Shell	Total Personnel Available
Heritage features assessment	1 team leaders 2 team members (including either ROV operator or marine diver/s)	1 team leaders 2 team members (including either ROV operator or marine diver/s)	N/A	N/A	1 team leaders 2 team members (including either ROV operator or marine diver/s)
Social impact assessment	1 team leader 2 team members	N/A	N/A	3-4 Social impact assessment specialists	3-4 Social impact assessment specialists

** Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment*

11 Review of Plan

As part of the Environment Plan review cycle, this document will be reviewed annually and revised, if required, in accordance with the Shell's Management of Change Manual. This could include changes required in response to one or more of the following:

- When major changes have occurred which affect Operational and/or Scientific Monitoring coordination or capabilities (e.g. change of service provider/s);
- Changes to the activity that affect Operational and/or Scientific Monitoring coordination or capabilities (e.g. a significant increase in spill risk);
- Changes to legislative context related to Operational and/or Scientific Monitoring (e.g. EPBC Act protected maters requirements);
- Following routine testing of the OSM if improvements or corrections are identified; or
- After a Level 2/3 spill incident.

The extent of changes made to this OSM Bridging Implementation Plan and resultant requirements for regulatory resubmission will be informed by the relevant Commonwealth regulations, i.e. the OPGGS (E) Regulations.

Part B – Implementation

12 Activation Process

Shell's IMT Environment Unit Leader is responsible for activating OSM components, subject to approval from the Incident Commander. Table 12-1 outlines Shell's OSM activation process.

Table 12-1: OSM Activation Process

Responsibility	Task	Timeframe	Complete
Environment Unit Leader (Titleholder)	Review initiation criteria of OMPs and SMPs during the preparation of the initial Incident Action Plan (IAPs) and subsequent IAPs; and if any criteria are met, activate relevant OMPs and SMPs	Within 4 hours of spill notification	❑
	Obtain approval from Incident Commander Leader to initiate OSM	Within 4 hours of spill notification	❑
	Contact OSM Services Provider and notify on-call officer of incident, requesting provision of OSM Implementation Lead to the IMT.	Within 4 hours of spill notification	❑
	Provide monitor and evaluate data (e.g. aerial surveillance, fate and weathering modelling and tracking buoy data) to OSM Services Provider	Within 1 hour of data being received by IMT	❑
	Liaise directly with OSM Services Provider to confirm which OMPs and SMPs are to be fully activated	Within 3 hours of monitor and evaluate data being received from IMT	❑
	Provide purchase order to OSM Services Provider (cross reference OSM Standby Services Scope of Work)	Within 72 hours of initial notification to OSM Services Provider	❑
	Record tasks in Personal Log	At time of completion of task	❑
OSM Services Provider	On-call officer to notify Service Provider Manager of activation and contact OSM Implementation Lead and Scientific Logistics Coordinator	Within 8 hours of notification being made to OSM Services Provider	❑
	Send OSM Implementation Lead and Scientific Logistics Coordinator to the Shell IMT	Within 12 hours of notification being made to OSM Services Provider	❑

Responsibility	Task	Timeframe	Complete
	Liaise directly with EUL to determine which OMPs and SMPs are to be fully activated	Within 4 hours of monitor and evaluate data being received from IMT	❑
	Confirm availability of initial personnel and equipment resources	Within 5 hours of monitor and evaluate data being received from IMT	❑

13 Monitoring Priorities

As described in Section 2, the available spill trajectory modelling can be used to understand the likely initial monitoring priorities for its activities in the Browse region. In addition, Table 4-2 lists comparability of available baseline data for receptors, to assist in identifying where post-spill, pre-impact monitoring should be prioritised.

The monitoring priorities provided in Section 2 and Table 4-2 are to be used for guidance when confirming monitoring priorities with key stakeholders and monitoring service providers (including subject matter experts, where available) at the time of the spill. Additionally, actual spill data gained during the initial stages of a spill response should be used to refine the list of monitoring priorities (refer to the first task listed in Table 13-1 below for details). Table 13-1 provides a checklist to assist in the confirmation of monitoring priorities for individual spills.

Table 13-1: Checklist for determining monitoring priorities

Responsibility	Task	Timeframe	Complete
OSM Services Provider with input from Environment Unit Leader (Shell)	Confirm monitoring locations for activated OMPs and SMPs based on: • Current monitor and evaluate data (i.e. situational awareness data, including predicted time to receptor impact, aerial/vessel surveillance observations, tracking buoy data, satellite data); • Nature of hydrocarbon spill (i.e. subsea blow out, surface release, hydrocarbon characteristics, volume, expected duration of release) • Seasonality and presence of receptors impacted or at risk of being impacted; • Current information on transient and broadscale receptors (surface and subsea)	Within 12 hours of monitor and evaluate data being received from IMT	❑

Responsibility	Task	Timeframe	Complete
	• Current operational considerations (e.g. weather, logistics); • Nature of hydrocarbon spill (i.e. subsea blow out, surface release, hydrocarbon characteristics, volume, expected duration of release) • Monitoring priorities in Section 2; and • Existing literature, baseline data, and monitoring programs.		
	Evaluate monitoring priorities in consultation with key stakeholders, including the appointed State/Territory Environment and Science Coordinator	Within 12 hours of monitor and evaluate data being received from IMT	❑
	Using the results of the baseline data analysis in Table 4-2 and the information above, determine priority locations for post-spill, pre-impact monitoring	Within 12 hours of monitor and evaluate data being received from IMT	❑
	Confirm the need for any additional reactive baseline monitoring data for SMPs and determine suitable locations, noting that suitable control or reference sites may be outside of the EMBA	Within 12 hours of monitor and evaluate data being received from IMT	❑
	Continually re-evaluate monitoring priorities in consultation with EUL and relevant key stakeholders throughout spill response (and with Shell Environment Advisor. See Section 6 and relevant key stakeholders' post-response)	Ongoing	❑

14 Protected Matters Requirements

Table 14-1 provides a checklist to ensure monitoring personnel consider protected matters requirements in the finalisation of OMPs and SMPs.

Appendix B: Protected Matters in the outlines the management plans, recovery plans and conservation advice statements relevant for the protected matters within the Browse region that are likely to be relevant to the final design of the OMPs and SMPs. Appendix B: Protected Matters in the also includes relevant priority monitoring locations where these receptors are known to occur in order to expedite consideration of relevant information into finalised monitoring designs.

Table 14-1: Checklist for inclusion of protected matters into monitoring designs

Responsibility	Task	Complete
OSM Services Provider with input from Environment Unit Leader (Shell)	Review Monitoring, Evaluation and Surveillance data and available OMP data to determine likely presence and encounter of protected species in predicted trajectory of the spill	❑
	Review the relevant recovery plan/conservation advice/management plan in Appendix B: Protected Matters in the and determine if there have been any updates to the relevant conservation threats/actions. Integrate relevant considerations into the final monitoring design for affected OMPs and SMPs	❑
	Review restrictions on marine mammal buffer distances in SMP: Marine mega-fauna and ensure this is included in all relevant response and monitoring IAPs (e.g. Shoreline Protection Plan, Shoreline Clean-up Plan, OSM Plan), so that response and monitoring field teams maintain required buffer distances from fauna during operations	❑

15 Finalising Monitoring Design

The methods presented in the Joint Industry OMPs and SMPs are designed to allow Monitoring Providers with the flexibility to modify the standard operating procedures, so that the latest research, technologies, equipment, sampling methods and variables may be used. Monitoring designs may also be varied in-situ, according to the factors presented in Section 10.6 of the Joint Industry OSM Framework.

Shell's checklist for finalising monitoring designs post-spill is provided in Table 15-1. The OSM Implementation Lead will be responsible for approving the finalised monitoring design used in the OMPs and SMPs.

Table 15-1: Checklist for finalising monitoring designs

Responsibility	Task	Timeframe	Complete
OSM Services Provider	Confirm survey objectives, sampling technique, for each initiated OMP and SMP	Within 48 hours of initial monitoring priorities being confirmed by IMT	❑
	Determine suitable sampling frequency	Within 48 hours of initial monitoring priorities being confirmed by IMT	❑
	Finalise standard operating procedures	Within 48 hours of initial monitoring priorities being confirmed by IMT	❑
	Scientific monitoring: • Establish benchmarks and guidelines to be used • Confirm indicator species • Confirm parameters and metrics	Within 96 hours of initial monitoring priorities being confirmed by IMT	❑

16 Mobilisation

When the monitoring design has been finalised for each OMP and SMP, the OSM Services Provider shall work in conjunction with the Shell IMT Planning and Logistics Section to develop and execute a monitoring mobilisation plan, which should be incorporated into the Incident Action Planning process.

The OSM Services Provider will be required to coordinate the availability of personnel and equipment for all monitoring programs (with the exception of OMP: Air Quality Modelling and SMP: Social Impact Assessment). Shell will be responsible for flights, accommodation and victualing for field personnel. Shell will also be required to procure all vessels, aerial platforms and vehicles for OMP and SMP implementation.

A checklist for mobilising monitoring teams is provided in Table 16-1.

Note: OMP: Air quality modelling is a desk top assessment and should be mobilised as soon as practicable as it is not reliant on any mobilisation of field personnel.

Table 16-1: Checklist for mobilisation of monitoring designs

Responsibility	Task	Complete
OSM Services Provider with input from Environment Unit Leader (Shell)	Confirm availability of all monitoring personnel (noting required competencies in Section 10.1 and individual OMPs/SMPs)	❑
	Allocate number of teams, personnel, equipment and supporting resource requirements	❑
	Undertake HAZIDs as required and consolidate/review field documentation including safety plans, emergency response plans, and daily field reports	❑
	Develop site-specific health and safety plans which is compliant with Shell health safety and environment systems (including call in timing and procedures)	❑
	Conduct pre-mobilisation meeting with monitoring team/s on survey objectives, logistics, safety issues, reporting requirements and data management	❑
	Determine data management delivery needs of the IMT/EMT and process requirements, including data transfer approach and frequency/timing	❑
	Confirm data formats and metadata requirements with personnel receiving data	❑
	Logistics	
	Confirm flights, accommodation, and car hire arrangements are in place	❑
	Develop field survey schedules, detailing staff rotation	❑
	Equipment	
	Arrange survey platform (vessel, vehicle, aircraft) as required to survey or access survey sites and ensure they are equipped with appropriate fridge and freezer space for transportation of samples (and carcasses if collecting)	❑

Responsibility	Task	Complete
	Ensure vessels have correct fit-out specifications (e.g. winches, GPS, satellite, hiab, sufficient deck space, water supplies (fresh and/or salt), accommodation)	❑
	Confirm consumables (including personal protective equipment) have been purchased and will be delivered to required location	❑
	Liaise with NATA-accredited laboratories to confirm availability, limits of detection, sampling holding times, transportation, obtain sample analysis quotes and arrange provision of appropriate sample containers, Chain of Custody (CoC) forms and suitable storage options for all samples. Make arrangements for couriers (if necessary)	❑
	Confirm specialist equipment requirements and availability (including redundancy)	❑
	Check GPS units and digital cameras are working and that sufficient spare batteries and memory cards are available	❑
	Confirm sufficient equipment to allow integration of survey software and navigational systems (e.g. GPS, additional equipment and adaptors), and additional GPS units prepared	❑
	Confirm GPS survey positions (where available) have been QA/QC checked and pre-loaded into navigation software/positioning system	❑
	Check field laptops, ensuring they have batteries (including spares), power cable, and are functional	❑
	Check if a first aid kit or specialist PPE is required	❑
	Confirm arrangements for freight to mobilisation port is in place	❑

17 Permits and Access Requirements

Permit and access requirements apply to Marine Parks, Marine Protected Areas, restricted heritage areas, operational areas of industrial sites, defence locations, certain fauna and managed fisheries. Table 17-1 lists relevant protected areas within the Browse Region and the jurisdictional authority to be contacted to obtain the necessary permit or access permission.

The OSM Services Provider is responsible for submitting access and permit applications to all relevant Jurisdictional Authorities to conduct monitoring for OMPs and SMPs.

Table 17-1: Permits required in the Browse Region

Receptor	Location	Jurisdictional Authority	Relevant information on permits
State/Territory Marine Protected Areas; Fish Habitat Protection Areas	• Lalang-garram / Camden Sound • North Kimberley • Rowley Shoals • Eighty Mile Beach • Montebello Islands • Barrow Island • Muiron Islands • Ningaloo • Shark Bay	State/Territory government department with jurisdiction for parks and wildlife State/Territory government department with jurisdiction for fisheries	No specific permitting requirements exist for monitoring in WA marine protected areas, but additional information is available at - https://www.dpaw.wa.gov.au/management/marine , https://www.dpaw.wa.gov.au/management/marine/marine-parks-and-reserves and https://www.fish.wa.gov.au/Sustainability-and-Environment/Aquatic-Biodiversity/Marine-Protected-Areas/Pages/default.aspx No specific permitting requirements exist for monitoring in NT fish protection areas, but zones are described here - https://nt.gov.au/marine/recreational-fishing/when-and-where-to-fish/reef-fish-protection-areas
Ramsar wetland	• Browse Island • Ashmore Reef Marine Park • Cobourg Peninsula Ramsar site • Dales Ramsar site • Hosnies Spring Ramsar site	Commonwealth Department of Environment and Energy	Additional information on Ramsar wetlands and how they are protected as a matter of national environmental significance under the EPBC Act is available at https://www.environment.gov.au/epbc/what-is-protected/wetlands
Australian (Commonwealth) Marine Parks	• Oceanic Shoals Marine Park • Arafura Marine Park • Arnhem Marine Park	Parks Australia	Permit and licence application information for Marine Protected Areas (including monitoring) can be found at - https://onlineservices.environment.gov.au/parks/australian-marine-parks and https://onlineservices.environment.gov.au/parks/australian-marine-parks/permits

Receptor	Location	Jurisdictional Authority	Relevant information on permits
	• Agro-Rowley Terrace Marine Park • Kimberley Marine Park • Cartier Island Marine Park • Gascoyne Marine Park • Mermaid Reef Marine Park • Eighty Mile Beach Marine Park		Additional information on permitting requirements in Australian Marine Parks can be obtained through Parks Australia via email marineparks@environment.gov.au or phone 1800 069 352 Information on permits to access biological resources in Commonwealth areas can be found at - http://www.environment.gov.au/topics/science-and-research/australias-biological-resources/access-biological-resources-commonwealth
State/Territory Managed Fisheries	WA • Mackerel Fishery • Northern Demersal Scalefish Fishery • Northern Shark Fishery • Pearl Oyster Fisheries • West Coast Deep Sea Crustacean Fishery • Specimen Shell Managed Fishery	State/Territory government department with jurisdiction for fisheries	No specific permitting requirements exist for WA Fisheries, but additional information is available at – https://www.fish.wa.gov.au/Fishing-and-Aquaculture/Pages/default.aspx No specific permitting requirements exist for NT Fisheries, but additional information is available at –- https://dpir.nt.gov.au/fisheries

Receptor	Location	Jurisdictional Authority	Relevant information on permits
	• Marine Aquarium Fish Managed Fishery • Kimberley Gillnet and Barramundi Managed Fishery • WA Sea Cucumber Fishery • North Coast Prawn Fishery NT • Barramundi Fishery • Coastal Line Fishery • Coastal Net Fishery • Spanish Mackerel Fishery • Demersal Fishery • Offshore Net and Line Fishery • Mud Crab Fishery • Aquarium Fish/Display Fishery • Trepang Fishery • Timor Reef Fishery		

Receptor	Location	Jurisdictional Authority	Relevant information on permits
	• Fishing Tour Operator Fishery • Pearl Oyster Fishery • Bait Net Fishery		
Commonwealth Managed Fisheries	• Western Tuna and Billfish Fishery • Western Skipjack Fishery • Southern Bluefin Tuna Fishery • North West Slope Trawl Fishery • Northern Prawn Fishery • Western Deepwater Trawl Fishery	Australian Fishing Management Authority	Commonwealth Managed Fisheries (scientific permit for research/monitoring in an Australian Fishing Zone) https://www.afma.gov.au/fisheries-services/fishing-rights-permits
Indigenous Cultural Heritage	Sites are located throughout EMBA	State/Territory government department with jurisdiction for indigenous heritage	Entry access permits to Aboriginal Lands in WA - https://www.dplh.wa.gov.au/entrypermits Aboriginal heritage sites in WA - https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-cultural-heritage/search-aboriginal-sites-or-heritage-places and https://www.dplh.wa.gov.au/information-and-services/aboriginal-heritage

Receptor	Location	Jurisdictional Authority	Relevant information on permits
			Indigenous heritage information in NT - https://nt.gov.au/leisure/arts-culture-heritage/visit-a-cultural-or-heritage-site/indigenous-heritage-information
Defence/restricted military area	North Australian Exercise Area (NAXA) offshore training area and the Browse Basin and Northern Carnarvon Basin offshore air-to-air weapons ranges (maritime military zones)	Department of Defence	Unexploded Ordanances (mapping information)– https://www.defence.gov.au/UXO/default.asp Maritime military firing practice and exercise areas - http://www.hydro.gov.au/factsheets/WFS_Firing_Practice_And_Exercise_Areas.pdf
Industry (e.g. operational zone of offshore oil or gas platform)	• Montara FPSO Facility (Jadestone) • Ichthys Facility (INPEX)	Operating company	Safety zones (up to 500 m from outer edge of well or equipment) – https://www.nopsema.gov.au/safety/safety-zones/
Shipwrecks	• A number of unnamed Indonesian fishing vessels and the *Sinar Bonerate* are known to be in the vicinity of Ashmore Reef and Cartier Island • The *Unident* and *Selina* are known to be in the vicinity of Browse Island	State/Territory or Commonwealth government department with jurisdiction for maritime cultural heritage/archaeology	Underwater heritage protected zones (Commonwealth) - www.environment.gov.au/heritage/underwater-heritage/protected-zones Commonwealth permit application - https://dmzapp17p.ris.environment.gov.au/shipwreck/public/forms/disturbanceAndZone.do?mode=add NT protected zones - https://nt.gov.au/leisure/arts-culture-heritage/visit-a-cultural-or-heritage-site/maritime-heritage

18 Use of Data in Response Decision-making

18.1 Operational Monitoring to Inform Response Activities

The OSM Services Provider is responsible for the collection of data by field teams, which shall be QA/QC checked by the Field Team Lead in accordance to the requirements listed in the finalised OMPs and SMPs (where applicable). The Team Lead will be responsible for communicating data back to the OSM Management Team (led by the OSM Services Provider) via field reporting forms, debriefs and reports. Laboratory analysis reports should also be directed to the OSM Management Team.

The OSM Management Team is responsible for the interpretation and analysis of data. OMP data should be rapidly analysed so that it may be used to inform planning and decisions in the current and/or next operating period. SMP data is designed to be more scientifically robust and long-term in nature and is not relied upon by the IMT for decision making. Therefore, SMP data will be analysed more thoroughly by the OSM Management Team.

Once data is analysed and checked by the Field Team Lead, it will be provided to the IMT Situation Unit Lead, who will then distribute the data from each monitoring component to the relevant IMT Unit and/or Section. Table 18-1 provides guidance on the type of data generated from each OMP, which IMT Section/Unit requires the data and how the data may be used during a response. All SMP data received during a response will be received by the IMT Situation Unit Lead and IMT Environment Unit Lead simultaneously.

Analysed data would then be incorporated into the Common Operating Picture (managed by the Situation Unit Lead) and used by the Environment Unit Lead during development of the operational SIMA, which would then be included in the IAP for the current or next operating period.

As ultimately responsible for the IAPs, the Planning Section Chief will be required to determine if the response options can be commended, continued, escalated, terminated, or if controls need to be put in place to manage impacts of the response activities. These decisions will be communicated to the broader IMT during regular situation debriefs.

Table 18-1: Data generated from each OMP and how this may be used by IMT in decision making

Operational Monitoring Plan	Data generated[3]	IMT Section requiring data	How data may be used by IMT
Hydrocarbon properties and weathering behaviour at sea	Hydrocarbon physical characteristics (e.g. viscosity, asphaltene content, fingerprinting, weathering ratios of hydrocarbon chains)	Planning Section to aid in response option selection / modification	Changes to the hydrocarbon properties will affect the window of opportunity for particular responses and the associated logistical requirements of these responses, such as use of chemical dispersants, recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements
Pre-emptive assessment of sensitive receptors at risk (desktop only)	Location of sensitive receptors in relation to known spill extent (derived initially from spill modelling and any surveillance data)	Planning Section to aid in IAP development	Confirm initial protection priorities in ICS 232 form (or similar); understand extent of baseline data; provide an understanding of stakeholders to be contacted to obtain local knowledge and validate current information
Shoreline clean-up assessment technique (SCAT)	Assessment of shoreline character; assessment of shoreline oiling; recommendations for response activities; post-treatment surveys	Planning Section to aid in IAP development and response option selection / modification	Confirmation of shoreline character, habitats and fauna present which may influence selection of response tactics (e.g. no mechanical recovery if turtles are known to be nesting); Oil removal rate for a shoreline sector will help determine effectiveness of relevant tactics (e.g. shoreline protection and/or clean-up operations); SCAT teams provide ground truthing of sites that are not possible via satellite imagery, therefore the IMT can rely on recommendations SCAT teams (e.g. flagging access issues, suitable tactics, likely resourcing needs)
Surface chemical dispersant effectiveness and fate	Visual observations of dispersant efficacy; concentration of hydrocarbons in water column (see also water quality assessment);	Environment Unit for use in operational SIMA; Planning Section to aid in IAP development; Operations Section to confirm dispersant effectiveness for decision making purposes in current operations period.	Determine the effectiveness of dispersant in removing oil from sea surface and how dispersed oil is being distributed through the water column. This information can be used in SIMA to help decide if dispersants are being effective at treating high value receptors (SIMA to evaluate any trade-offs between receptors)

[3] Summary only. For additional detail, please refer to individual OMPs. Also note data outputs will be reliant on finalised monitoring design.

Operational Monitoring Plan	Data generated[3]	IMT Section requiring data	How data may be used by IMT
Subsea dispersant injection	Visual observations of dispersant efficacy; concentration of hydrocarbons in water column (see also water quality assessment)	Source Control Branch to aid decision making for other source control operations; Environment Unit for use in operational SIMA; Planning Section to aid in IAP development.	Determine efficacy of subsea dispersant in treating oil to help understand if injection should continue or be modified; understand the nature and extent of the subsea plume; and provide an initial assessment of potential ecological effects. This information can be used in SIMA to help decide if dispersants are being effective at treating high value receptors (SIMA to evaluate any trade-offs between receptors) and also if subsea dispersants are effectively reducing volatile organic compound (VOC) levels so that operations are within lower explosive limits (LEL)
Hydrocarbon spill modelling	Forecasting and movement of spill; simulations of spill with different response options applied (e.g. dispersants)		Trajectory will help understand movement of spill and identify receptors that may be at risk of exposure to help direct resources for best effect; modelling will help predict hydrocarbon concentrations, which can be verified when used in conjunction with water quality monitoring and surveillance tactics; simulations with different response options could help the IMT/EMT predict the outcome of applying different response options in different locations (e.g. dispersants in deeper waters and containment and recovery in nearshore waters)
Water quality assessment	Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BETEXN, PAH), physio-chemical parameters and dispersant detection	Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill within the water column and verify spill modelling and surveillance data; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites. Data can also influence ongoing use of dispersant through ongoing operational SIMA.
Sediment quality assessment	Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BETEXN, PAH)	Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites

Operational Monitoring Plan	Data generated[3]	IMT Section requiring data	How data may be used by IMT
Marine fauna assessment • Reptiles • Cetaceans (observational only) • Dugongs • Seabirds and shorebirds • Fish	Rapid assessment of presence and distribution of marine fauna; evaluate impact of spill and response activities on fauna	Planning Section for use in IAP; Oiled Wildlife Unit/Division to help in developing Wildlife Response Sub-plan	Understanding of species, populations and geographical locations at greatest risk from spill impacts. IMT can use this information to help qualify locations with highest level of protection priority (e.g. dugong nursery area is at risk of high contact therefore dispersant use closest to spill source may be a preferred option); understanding the impacts of spill response activities can help IMT to modify or terminate activities if they are assessed as creating more harm than the oil alone (e.g. large shoreline clean-up teams and staging areas may disturb shorebird nesting resulting in adults abandoning chicks)
Air quality modelling (responder health and safety)	Modelled outputs of airborne hydrocarbons, gases and chemicals and their predicted distribution	Operations Section to help determine safe zones in close vicinity of spill; Planning Section for use in IAP	Determine safe distances from spill source for response personnel; determine the presence and persistence of volatile organic compounds to know if response areas are safe for personnel

18.2 Impacts from Response Activities

Table 10-4 of the Joint Industry OSM Framework outlines the potential impacts from response activities and the relevant OMP/SMP for monitoring impacts. For example, if shoreline clean-up was being considered as a response option, then possible impacts resulting from that activity could include physical presence, ground disturbance, water/sediment quality decline and lighting/noise impacts to fauna.

When finalising monitoring designs, the OSM Implementation Lead shall review Table 10-4 of the Joint Industry OSM Framework to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs.

18.3 Operational Monitoring of Effectiveness of Control Measures and to Ensure EPS are met

When finalising monitoring designs, the OSM Implementation Lead and Environment Unit Lead (or delegate) shall review the Environmental Performance Standards listed in the Browse Regional OPEP and integrate checks into the monitoring design that will help determine if relevant Environmental Performance Standards are being met.

Table 18-2 provides Environmental Performance Standards listed in Browse Regional OPEP and how operational monitoring may be able to confirm it is being met.

Table 18-2: Environmental Performance Standards

Environmental Performance Standard	Confirmation that Environmental Performance Standard is being met
Initiation criteria of OMPs and SMPs will be reviewed during the preparation of the initial Incident Action Plan (IAPs) and subsequent IAPs; and if any criteria are met, relevant OMPs and SMPs will be activated	Incident Action Plan and Incident Log
Monitoring to be conducted in accordance with the Operational and Scientific Monitoring (OSM) Bridging Implementation Plan (HSE_PRE_16370)	Incident log and monitoring records
OSMP decision making and implementation to be approved by personnel holding the competencies outlined in Section 10 of the Operational and Scientific Monitoring Bridging Implementation Plan (HSE_PRE_16370)	Incident Log and register of IMT and support personnel

19 Data Management

Minimum standards for data management are provided in Section 10.11 of the Joint Industry OSM Framework.

20 Quality Assurance and Quality Control

Refer to Section 10.11 of the Joint Industry OSM Framework for QA/QC minimum standards.

21 Communication Protocol

Communication protocols between Shell and its OSM Services Provider with respect to delivery of the OMPs and SMPs (during both preparedness and implementation) are intentionally defined to ensure clear and consistent information is provided in both directions. This clear and consistent messaging is critical in what would be a highly dynamic and evolving situation.

21.1 OSM Services Provider/s

The following communication protocols must be observed:

- Communication between Shell and its OSM Services Provider during the preparedness phase (pre-spill) and during activation (prior to deployment) will be between the Environment Unit Lead (EUL) (or delegate) and the OSM Services Provider Lead respectively.
- During implementation (post deployment), primary communication occurs via two pathways:
    1. EUL and the OSM Services Provider Lead for contractual, management, scientific and general direction matters; and
    2. Shell On-Scene Commander and the OSM Services Provider's Field Operations Manager for on-site matters.
- All OSM operational decisions should be logged in an OSM decision log by key personnel.
- All OSM tasks, actions and requirements should be documented in an IAP during the response phase of the spill.
- The Shell EUL will keep the Operations Section Chief, Logistics Section Chief and Planning Section Chief briefed of the OSM status as required.
- All correspondence (copies of emails and records of phone calls) between Shell and the OSM Services Provider during a response should be recorded and kept on file.
- All communication received by OSM Services Provider not in line with these protocols should be reported to the EUL who will seek guidance on the accuracy of the information received.
- Unless related to safety (e.g. evacuation), any direction or instruction received by the OSM Services Provider outside of these protocols should be confirmed via the Shell EUL or On-Scene Commander prior to implementation.

During the post-response phase all communications shall be between the Shell Environment Advisor and the OSM Services Provider OSM Implementation Lead.

21.2 External Stakeholders

Results of OMPs and SMPs will be discussed with relevant stakeholders. Information will be shared with regulatory agencies/authorities as required and inputs received from stakeholders will be evaluated and where practicable, will be used to refine the ongoing spill response and/or ongoing operational and/or scientific monitoring.

Shell's IMT Public Information Officer and/or Liaison Officer (initially be will same individual) will be the focal point for external engagement during the response operation.

Stakeholder communications post-response will be managed by Shell's External (Government) Corporate Relations Team.

22 Stand Down Process

Monitoring for each component will continue until termination criteria for individual components are reached. Typically, OMPs will terminate when agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response or a relevant SMP has been activated. SMPs will continue after the spill response has been terminated and until such time as their termination criteria are also reached. A list of criteria is provided in the OSM Framework.

After OMPs are terminated, the OMP monitoring teams will be advised to stand down. Following this stage, the OSM Services Provider will run a lessons-learnt meeting between Shell, all monitoring providers and other relevant stakeholders. It is the responsibility of Shell to ensure that lessons learnt are communicated to the relevant stakeholder groups. The lessons discussed should include both positive actions to be reinforced and lessons for actions that could be improved in future standby or response campaigns.

23 References

APPEA (2021) Joint Industry Operational and Scientific Monitoring Plan Framework. Rev D. Report prepared by BlueSands Environmental for APPEA Marine and Environmental Science Working Group.

Department of Environment and Conservation (DEC) (2007) Rowley Shoals Marine Park Management Plan (2007) 2007–2017, Management Plan No. 56. DEC, Perth, WA

Department of Parks and Wildlife (DPaW) (2014) Eighty Mile Beach Marine Park Management Plan 2014–2024, Management Plan No. 80, DPaW, Perth, WA

DPaW (2016) North Kimberley Marine Park Joint management plan 2016. Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management areas, No. 89. DPaW, Perth, WA

DPaW (2013) Lalang-garram / Camden Sound Marine Park management plan No. 73 2013–2023, DPaW, Perth, WA

Kirby MF, Brant J, Moore J, Lincoln S (eds) (2018) PREMIAM – Pollution Response in Emergencies – Marine Impact Assessment and Monitoring: Post-incident monitoring guidelines. Second Edition. Science Series Technical Report. Cefas, Lowestoft.

24 Abbreviations and Acronyms

Abbreviation/Acronym	Definition
ALA	Atlas of Living Australia
AMOSC	Australian Marine Oil Spill Centre
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
BIA	Biologically Important Areas
CoC	Chain of Custody
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Western Australian Department of Biodiversity Conservation and Attractions
DoAWE	Commonwealth Department of Agriculture, Water and the Environment
DoT	Western Australian Department of Transport
DPTI	South Australian Department of Planning, Transport and Infrastructure
EMBA	Environment that may be Affected
EP	Environment Plan
EUL	Environment Unit Lead
GIS	Geographic Information System
GPS	Geographic Positioning System
HSE	Health, Safety, and Environment
IAP	Incident Action Plan
ICS	Incident Command System
IMT	Incident Management Team
IMT Leader	Incident Management Team Leader. Equivalent to an Incident Controller or Incident Commander.
KEF	Key Ecological Feature
OMP	Operational Monitoring Plan
OPEP	Oil Pollution Emergency Plan
OPGGS (E)	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 Regulations
OSM	Operational and Scientific Monitoring
OSRA	Oil Spill Response Atlas
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling

Abbreviation/Acronym	Definition
OWR	Oiled Wildlife Response
EMBA	Environment that May Be Affected
PPE	Personal Protective Equipment
QA/QC	Quality Assurance and Quality Control
SIMA	Spill Impact Mitigation Assessment
SMP	Scientific Monitoring Plan
SSDI	Subsea Dispersant Injection
SWIS	Subsea Well Intervention Services
UAV	Unmanned Aerial Vehicle

Appendix A: Baseline Data Sources

Table A1: Baseline Data Sources

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
Water and sediment quality	Hydrocarbon abundance and distribution (including natural seeps) in the vicinity of the Prelude/Ichthys fields of the Browse Basin	CSIRO/AIMS (Link to report)	East Browse Basin
	McAlpine, KW, Sim, CB, Masini, RJ and Daly, T 2010, Baseline petroleum hydrocarbon content of marine water, shoreline sediment and intertidal biota at selected sites in the Kimberley bioregion, Western Australia. Marine Technical Report Series No. MTR3, Office of the Environmental Protection Authority (OEPA), Perth, Western Australia.	WA EPA (Link to report)	Kimberley bioregion (16 shoreline sites, mainland and islands, spanning 340 km)
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment (also described in Ecological studies of the Bonaparte Archipelago and Browse Basin – Cetacean survey – additional detail on a 2006 aerial survey in contained in this report)	INPEX (Link to report)	Browse Basin Region (Ichthys Field to Echuca Shoal)
	Montara Reports 'Control site water quality data' (Operational Monitoring Study O2 – Monitoring of Oil Character, Fate and Effects, Report 02 Water Quality and Monitoring of Oil Character, Fate and Effects, Report 03 Dispersant Treated Oil Distribution)	PTTEP (Link to report)	Broome to Darwin (Mainland) Islands – Browse, Ashmore, Cartier, Hibernia Reef
Shorelines and intertidal habitats	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment	INPEX (Link to report)	Browse Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Montara Reports: Shoreline Ecological Assessment Aerial and Ground Surveys 7-19 November 2009 (Kimberley Coast)	PTTEP (Link to report)	Kimberley Coast
	Shoreline Assessment Ground Survey: An operational component of the Monitoring Plan for the Montara Well Release Timor Sea (Ashmore, Cartier and Hibernia Islands).	PTTEP (Link to report)	Ashmore, Cartier and Hibernia Islands
Benthic communities and fish assemblages	Scott Reef Research Project - Long-term monitoring of shallow water coral and fish communities at Scott Reef	AIMS (Link to reports)	Scott Reef (South Reef, North Reef and Seringapatam Reef)
	The composition and structure of shallow benthic reef communities in the Kimberley, north-west Australia	WA Museum (Link to report)	Kimberley Region
	Montara: Vulcan, Barracouta East and Goeree Shoals Survey 2013; Heyward et al 2013; Report for PTTEP Australasia (Ashmore Cartier) Pty Ltd. Australian Institute of Marine Science, Perth.	PTTEP (Link to report)	Barracouta, Goeree and Vulcan Shoals
	Montara: Barracouta, Goeree and Vulcan Shoals Survey 2016 Report for PTTEP Australasia (Ashmore Cartier) Pty Ltd. Australian Institute of Marine Science, Townsville.	PTTEP (Link to report)	Barracouta, Goeree and Vulcan Shoals
	Montara reports: Final Report on Benthic Surveys at Ashmore, Cartier and Seringapatam Reefs (post-spill)	PTTEP (Link to report)	Ashmore, Cartier and Seringapatam Reefs
	Applied Research Program	Shell/INPEX (Link to report)	Echuca and Heywood shoals

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	(ARP7): Subtidal Benthos: towards benthic baselines in the Browse Basin. Final report – Submerged Shoals		
	Marine Biodiversity Survey of Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef	Western Australian Museum (Link to report)	Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment	INPEX (2010) (Link to report)	Browse Island, Echuca Shoal, Ichthys Field
	ARP7: Subtidal Benthos: towards benthic baselines in the Browse Basin - Quantitative information on the abundance, diversity and temporal variability of benthos and associated fish – Browse Island reef	AIMS (Shell/INPEX)	Browse Island
	Benthic primary productivity: production and herbivory of seagrasses, macroalgae and microalgae	WAMSI (Link to report)	Bardi Jawi Indigenous Protected Area (IPA), encompassing Cygnet Bay, One Arm Point, Jalan (Tallon Island) and Iwany (Sunday Island)
	Baselines of benthic communities, herbivory and reef metabolism at Browse Island	CSIRO/UWA/AIMS (Link to report)	Browse Island
	Egg size and fecundity of biannually spawning corals at Scott Reef	AIMS - Foster, T and Gilmour, J (Link to report)	Scott Reef
Marine reptiles		SKM/Woodside (Link to report)	Scott Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Long term monitoring of the marine turtles of Scott Reef		
	Marine Turtles in the Kimberley: key biological indices required to understand and manage nesting turtles along the Kimberley coast	WAMSI (Link to report)	Near complete coverage of Kimberley Coast and Islands (>44,000 georeferenced images)
	Ecology of Marine Turtles of the Dampier Peninsula and the Lacepede Island Group, 2009–2010	RPS/Woodside (Link to report)	Dampier Peninsula and the Lacepede Islands
	Ecological studies of the Bonaparte Archipelago and Browse Basin – Marine Turtles	INPEX (Waayers, D) (Link to report)	Maret Islands and other islands in the Bonaparte Archipelago
Seabirds and shorebirds	The status of seabirds and shorebirds at Ashmore Reef, Cartier Island and Browse Island. Monitoring Program for the Montara Well Release. Pre-Impact Assessment and First Post-Impact Field Survey	PTTEP (Clarke, R. et al) (Link to report)	Ashmore Reef (including Cartier Island) and Browse Island
	Evaluating the impacts of local and international pressures on migratory shorebirds in Roebuck Bay and Eighty Mile Beach	WAMSI (Rogers et al.) (Link to report)	Roebuck Bay and Eighty Mile Beach
	Adele Island Bird Survey Report	DBCA (Boyle, et al.) (Link to report)	Adele Island
	Shell/INPEX ARP6 Milestone Report #7- Lacepede Islands: Report comparing the diet composition, foraging habitat and breeding between species and between years on Lacepede islands	Monash/UWA/AIMS	Lacepede Islands

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Ecological studies of the Bonaparte Archipelago and Browse Basin – Seabird survey	INPEX (Link to report)	Browse Island and Maret Islands
Marine mammals	Humpback Whale Survey Report. Browse Marine Mammal Fauna Survey	Woodside (RPS) (Link to Humpback Whale report 2010) (Link to Humpback Whale report 2011) (Link to dugong report 2009)	Browse Basin – James Price Point Migration Corridor, Pender Bay, Gourdon Bay, Scott Reef
	Humpback whale use of the Kimberley: understanding and monitoring spatial distribution (analysis of historical data, including other reports mentioned in this review. Also provides analysis of whale survey techniques and recommendations for future monitoring)	WAMSI	Kimberley region
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment (also described in Ecological studies of the Bonaparte Archipelago and Browse Basin – Cetacean survey – additional detail on a 2006 aerial survey in contained in this report)	INPEX (Link to report)	Browse Basin Region (Browse Island to Scott Reef)
	Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (Dugong dugon) management in the Kimberley	WAMSI (Link to report)	North Kimberley (Broome to NT border) South Kimberley (Broome to Port Hedland)
Commercial fisheries	Commercial Fisheries data collected by WA Department of Fisheries (WA DoF) and Australian Fishing Management Authority (AFMA)	WA Department of Fisheries / Australian Fishing Management Authority	Australia wide
	Montara Well Release: Olfactory analysis of Timor Sea fish fillets	Curtin University/PTTEP (Link to report)	Timor Sea

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Montara Well Release Monitoring Study S4A - Assessment of Effects on Timor Sea Fish	Curtin University/PTTEP (Link to report)	Vulcan Shoal, Heywood Shoal, Browse Island, Echuca Shoal, Scott Reef
	Montara Well Release: Assessment of Fish catch for the presence of Oil	PTTEP (Link to report)	Northern Demersal Scalefish Managed Fishery (NDSF)
	Monitoring the Northern Demersal Scalefish Managed Fishery: Establishing Baseline Biomarker Levels in Commercially Important Demersal Fishes	Curtin/AIMS	East Browse Basin
	Monitoring the Northern Demersal Scalefish Managed Fishery: accounting for spatial variability and detecting change in key fish populations	Curtin/CSIRO/AIMS	East Browse Basin

Appendix B: Protected Matters in the Browse Region

Table 0-1 is an example of the management plans, recovery plans and conservation advice statements relevant for the protected matters within the Browse Region that are likely to be relevant to the final design of the OMPs and SMPs. Table 0-1 also includes relevant priority monitoring locations for the 42,000 m^2 over 2 hours (vessel collision) spill scenario, where these receptors are known to occur in order to guide consideration of relevant information into finalised monitoring designs.

Table 0-1: Protected matters in the EMBA, relevant monitoring plans and priority sites

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Mammals				
Sei whale	Approved conservation advice *Balaenoptera borealis* (sei whale) (Threatened Species Scientific Committee 2015a)	• Relevant threat/s: pollution, vessel disturbance • Relevant management actions: report vessel strikes	• OMP: Marine fauna assessment – Cetaceans • SMP: Marine mega-fauna assessment - Whale sharks, dugongs and cetaceans	N/A
Blue whale	Conservation management plan for the blue whale: A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999 2015-2025 (Commonwealth of Australia 2015a)	• Relevant threat/s: pollution , vessel strike • Relevant management actions: Minimising vessel collisions, measuring and monitoring population recovery		Seringapatam Reef/Scott Reef (7.8 days)
Fin whale	Approved conservation advice for *Balaenoptera physalus* (fin whale) (Threatened Species Scientific Committee 2015b)	• Relevant threat/s: habitat modification, vessel disturbance • Relevant management actions: report vessel strikes		N/A
Humpback whale	Approved conservation advice for *Megaptera novaeangliae* (humpback whale) (Threatened	• Relevant threat/s: habitat degradation, vessel disturbance or strike.		Buccaneer Archipelago (23 days - entrained)

[4] Planning scenario used = vessel collision (42,000 m^3 condensate from **Error! Reference source not found.**). Unless otherwise noted, all results are floating oil timeframes to contact.

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
	Species Scientific Committee 2015c)	• Relevant management actions: Minimise vessel collisions.		
Southern right whale	Conservation management plan for the southern right whale: a recovery plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2011-2021 (DSEWPaC 2012c)	• Relevant threat/s: habitat modification, vessel disturbance • Relevant management actions: Addressing vessel collisions, measuring and monitoring population recovery		N/A
Reptiles				
Loggerhead turtle, green turtle, leatherback turtle, hawksbill turtle, flatback turtle, olive ridley turtle	Recovery plan for marine turtles in Australia (Commonwealth of Australia 2017)	• Relevant threat/s: chemical and terrestrial discharge, light pollution, vessel disturbance, habitat modification • Relevant management actions from recovery plan : <u>Chemical and terrestrial discharge</u> ○ Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g.	• OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Reptiles • SMP: Marine mega-fauna assessment – Reptiles	• Browse Island (1.8 days) • Cartier Island (4.5 days) • Ashmore Reef (5.5 days) • Seringapatam Reef/Scott Reef (7.8 days) • Buccaneer Archipelago (23 days - entrained)

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
		nesting habitat, seagrass meadows or coral reefs. ○ Quantify the impacts of decreased water quality on stock viability. ○ Quantify the accumulation and effects of anthropogenic toxins in marine turtles, their foraging habitats and subsequent stock viability. <u>Light</u> ○ Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats		
Leatherback turtle	Approved conservation advice for *Dermochelys coriacea* (Leatherback Turtle) (Threatened Species Scientific Committee 2008a)	• Relevant threat/s: changes to breeding sites, vessel strike • Relevant management actions: Addressing vessel collisions, Measuring and monitoring population recovery		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Short-nosed seasnake	Approved conservation advice for *Aipysurus apraefrontalis* (short-nosed sea snake) (Threatened Species Scientific Committee 2010a)	No relevant threat or management actions identified		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Leaf-scaled seasnake	Approved conservation advice for *Aipysurus foliosquama* (leaf-scaled sea snake) (Threatened Species Scientific Committee 2010b)	No relevant threat or management actions identified		Ashmore Reef (5.5 days)
Sharks and rays				
White shark	Recovery plan for the white shark (*Carcharodon carcharias*) (DSEWPaC 2013)	• Relevant threat/s: habitat modification. • Relevant management objectives: Continue to identify and protect habitat critical to the survival of the white shark and minimise the impact of threatening processes within these areas	• OMP: Marine fauna assessment – Fish • SMP: Marine mega-fauna assessment - Marine fish and elasmobranch assemblages assessment	N/A
Northern river shark	Approved conservation advice for *Glyphis garricki* (northern river shark) (Threatened Species Scientific Committee 2014a)	• Relevant threat/s: habitat modification • Relevant management objectives: implement measures to reduce		Buccaneer Archipelago (23 days - entrained)

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
	Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015b)	adverse impacts of habitat degradation and/or modification		
Green sawfish	Approved conservation advice for green sawfish (Threatened Species Scientific Committee 2008b)	• Relevant threat/s: habitat degradation through coastal development • No relevant management actions identified		
	Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015b)	• Relevant threat/s: habitat modification Relevant management objectives: implement measures to reduce adverse impacts of habitat degradation and/or modification		
Whale shark	Approved conservation advice *Rhincodon typus* whale shark (Threatened Species Scientific Committee 2015d)	No relevant threat or management actions identified	• OMP: Marine fauna assessment – Fish • SMP: Marine mega-fauna assessment - Whale sharks, dugongs and cetaceans	Cartier Island (4.5 days)
Grey nurse shark (west coast population)	Recovery plan for the grey nurse shark (*Carcharias taurus*) (Department of the Environment 2014)	No relevant threats or management actions identified	• OMP: Marine fauna assessment – Fish • SMP: Marine mega-fauna assessment -	N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Dwarf sawfish	Approved conservation advice for *Pristis clavata* (dwarf sawfish) (Threatened Species Scientific Committee 2009) Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015b)	• Relevant threat/s: habitat degradation due to increasing human development in northern Australia • No relevant management actions identified	Marine fish and elasmobranch assemblages assessment	N/A
Freshwater sawfish	Approved conservation advice for *Pristis pristis* (largetooth sawfish) (Threatened Species Scientific Committee 2014b) Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015b)	• Relevant threat/s: habitat degradation and modification • No relevant management actions identified		N/A
Birds				
Migratory shorebird species[5]	Wildlife conservation plan for migratory shorebirds (Commonwealth of Australia 2015c)	• Relevant threat/s: habitat modification, acute pollution, anthropogenic disturbance • No relevant management actions identified	• OMP: Shoreline clean-up assessment technique (SCAT)	Ashmore Reef (5.5 days)

[5] Red knot, great knot, greater sand plover, lesser sand plover and bar-tailed godwit.

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Albatrosses and giant petrels[6]	National recovery plan for threatened albatrosses and giant petrels (DSEWPaC 2011)		• OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Seabirds and shorebirds	N/A
Australian lesser noddy	Approved Conservation Advice for *Anous tenuirostris melanops* (Australian lesser noddy) (Threatened Species Scientific Committee 2015e)	• Relevant threat/s: damage to nesting habitat, oil spills • No relevant management actions identified		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Red knot, knot	Approved Conservation Advice for *Calidris canutus* (Red knot) (Threatened Species Scientific Committee 2016a)	• Relevant threat/s: damage to nesting habitat, pollution • Relevant management actions: manage disturbance at important sites which are subject to anthropogenic disturbance when red knot are present – e.g. discourage or prohibit vehicle access, implement temporary site closures		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Curlew sandpiper	Conservation advice *Calidris ferruginea* curlew sandpiper	No relevant threats or management actions identified		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)

[6] Several albatrosses and giant petrels were identified as potentially occurring: Amsterdam albatross, southern royal albatross, wandering albatross, southern giant-petrel, northern giant petrel, soft-plumaged petrel, Indian yellow-nosed albatross, Tasmanian shy albatross, white-capped albatross, Campbell albatross, black-browed albatross, white-capped albatross.

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
	(Threatened Species Scientific Committee 2015f)			
Eastern curlew	Conservation advice *Numenius madagascariensis* eastern curlew (Threatened Species Scientific Committee 2015g)	• Relevant threat/s: human disturbance to feeding and roosting sites • Relevant management actions: reduce disturbance at key roosting and feeding sites		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Abbott's booby	Approved Conservation Advice for *Papasula abbotti* (Abbott's booby) (Threatened Species Scientific Committee 2015h)	• Relevant threat/s: new clearing • Relevant management actions: Preventing activities in habitat critical to the survival that will remove habitat and disturb birds; preventing activities in buffer areas that may disturb nesting and roosting birds e.g. clearing vegetation that would result in increased wind turbulence or weed invasion in nesting and roosting habitat.		N/A
Great knot	Conservation advice *Calidris tenuirostris* great knot (Threatened Species Scientific Committee 2016b)	• Relevant threat/s: habitat loss and degradation, pollution • Relevant management actions: manage disturbance at important sites which are subject to anthropogenic disturbance when		• Ashmore Reef (5.5 days)

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
		red knot are present – e.g. discourage or prohibit vehicle access, implement temporary site closures		
Greater sand plover	Approved Conservation Advice for *Charadrius leschenaultii* (Greater sand plover) (Threatened Species Scientific Committee 2016c)	• Relevant threat/s: habitat loss and degradation, pollution • Relevant management actions: manage disturbance at important sites which are subject to anthropogenic disturbance when red knot are present – e.g. discourage or prohibit vehicle access, implement temporary site closures		• Ashmore Reef (5.5 days)
Lesser sand plover	Approved Conservation Advice for *Charadrius mongolus* (Lesser sand plover) (Threatened Species Scientific Committee 2016d)	• Relevant threat/s: habitat loss and degradation, pollution • Relevant management actions: manage disturbance at important sites which are subject to anthropogenic disturbance when red knot are present – e.g. discourage or prohibit vehicle access, implement temporary site closures		• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Soft-plumaged petrel	Conservation advice *Pterodroma mollis* soft-plumage petrel	• No relevant threats or management actions identified		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
	(Threatened Species Scientific Committee 2015i)			
Bar-tailed godwit (baueri)	Approved Conservation Advice for *Limosa lapponica baueri* (Bar-tailed godwit (western Alaskan) (Threatened Species Scientific Committee 2016e)	No relevant threats or management actions identified		• Ashmore Reef (5.5 days)
Australian painted snipe	Approved Conservation Advice on *Rostratula australis* (Australian Painted Snipe) (Threatened Species Scientific Committee 2013)	No relevant threats or management actions identified		N/A
Threatened Ecological Communities				
Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula	Approved Conservation Advice for the Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula	• Relevant threat/s : Clearing (shoreline clean-up and/or shoreline based monitoring activities) • Relevant management actions: Protect and conserve remaining areas of the ecological community, monitor condition of Monsoon vine tickets	• OMP: Shoreline clean-up assessment technique (SCAT) • SMP: Intertidal and Coastal Habitat Assessment	Buccaneer Archipelago (23 days - entrained)
RAMSAR Wetlands (refer to Section 7.2.5 of EP for additional description of key receptors for each location)				

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Ashmore Reef National Nature Reserve (birds, turtles, dugongs)	Ashmore Reef Commonwealth Marine Reserve Ramsar Site Ecological Character Description	• Relevant threat: oil and gas exploration and mining – boat strike, lighting, toxic effects of oil spills • Limits of acceptable change to elements (component, process, service) of ecological character defined in Table 27 of Ecological Character Description	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks,	• Cartier Island (4.5 days) • Ashmore Reef (5.5 days)
Roebuck Bay (birds)	Ecological Character Description for Roebuck Bay	• No relevant threat identified • Limits of acceptable change to elements (component, process, service) of ecological character defined in Table 22 of Ecological Character Description		N/A
Eighty-mile Beach (birds, intertidal habitats)	Ecological Character Description of the Eighty-mile Beach Ramsar Site	• Offshore petroleum / gas extraction identified as a minor driver (threatening activity); specifically, oil spills • Limits of acceptable change to elements (component, process, service) of ecological character defined in Table 21		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
		and 22 of Ecological Character Description	cetaceans and dugongs • SMP: Benthic habitat assessment	
The Dales (Christmas Island) (birds, cave communities)	Ecological Character Description for The Dales Ramsar Site	• No relevant threat identified • Limits of acceptable change to elements (component, process, service) of ecological character defined in Table 13 of Ecological Character Description		N/A
Australian Marine Parks (refer to Section 7.3.2 of EP for additional description of key receptors for each location)				
North-west Marine Parks Network	North-west Marine Parks Network Management Plan 2018	• Relevant management actions: Park protection and management—timely and appropriate preventative and restorative actions to protect natural, cultural and heritage values from impacts	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment	• Browse Island (1.8 days) • Heywood Shoal (3 days) • Echuca Shoal (3.5 days) • Cartier Island (4.5 days) • Ashmore Reef (5.5 days) • Vulcan Shoal (6.3 days • Seringapatam Reef/Scott Reef (7.8 days)

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
			• SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment	• Buccaneer Archipelago (23 days - entrained)
North Marine Parks Network	North Marine Parks Network Management Plan 2018	• Relevant management actions: Park protection and management—timely and appropriate preventative and restorative actions to protect natural, cultural and heritage values from impacts		N/A
South-west Marine Parks Network	South-west Marine Parks Network Management Plan 2018	• Relevant management actions: Park protection and management—timely and appropriate preventative and restorative actions to protect natural, cultural and heritage values from impacts		N/A
Western Australian Marine Parks (refer to Section 7.3.2 of EP for additional description of key receptors for each location)				
Lalang-garram / Camden Sound	Lalang-garram / Camden Sound Marine Park management plan 73 (2013–2023)	• Relevant management actions: marine mammal buffer distances, restrictions of access to whale calving and nursing areas, permitting requirements, all monitoring activities to comply	• OMP: Water quality assessment • OMP: Sediment quality assessment	Buccaneer Archipelago (23 days - entrained)

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
		with DPaW's Science Policy (No. 78) • Refer to Section 3.6 for performance measures and management targets	• OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment	
North Kimberley	North Kimberley Marine Park Joint management plan Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management areas management plan 89 (2016)	• Relevant management issues: oil spills, physical disturbance from vessels • Relevant management actions: permitting requirements, all monitoring activities to comply with DPaW's Science Policy (No. 78)		N/A
Rowley Shoals	Rowley Shoals Marine Park Management Plan No. 56 (2007)	• Relevant management issues: oil spills, physical disturbance to reefs, anchoring from vessels, boat strike (turtles/cetaceans), • Relevant management actions: ensure the values of the park are fed into predictive models for oil spills, apply appropriate anchoring practices, report fauna vessel strikes, implement access controls to Bedwell Island (red-tailed tropic bird breeding site)		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Eighty Mile Beach Marine Park	Eighty Mile Beach Marine Park management plan 80 2014 – 2024	• Relevant management issues: oil spills, physical disturbance to reefs, anchoring from vessels, boat strike (turtles/cetaceans) • Relevant management actions: ensure the values of the park are fed into predictive models for oil spills, apply appropriate anchoring practices	• SMP: Marine fish and elasmobranch assemblages assessment	N/A
Montebello Islands Marine Park/Barrow Island Marine Park/Barrow Island Marine Management Area	Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007–2017 Management Plan No 55	• Relevant management issues: oil spills, physical disturbance to reefs, anchoring from vessels, boat strike (turtles/cetaceans), lighting (turtles) • Relevant management actions: ensure the values of the park are fed into predictive models for oil spills, apply appropriate anchoring controls		N/A
Muiron Islands Marine Management Area and Ningaloo Marine Park	Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area (2005)	Plan no longer in effect. Refer to The Ningaloo Coast World Heritage Area.		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
Shark Bay Marine Park	Shark Bay Marine Reserves Management Plan	Plan no longer in effect. Refer to Shark Bay, Western Australia World Heritage Area		N/A
World Heritage Properties (refer to Section 7.3.1.1 of EP for additional description of key receptors for each location)				
Shark Bay World Heritage Property Strategic Plan 2008-2020	• Potential pollution sources include: oil spills. • Relevant management objective: Minimise the impact of pollution and waste on World Heritage values and the overall integrity of the World Heritage Property.	Relevant actions: Manage wildlife interactions in accordance with controls and regulations provided under the Wildlife Conservation Act and CALM Act; In consultation with relevant management agencies, identify research and monitoring priorities for cultural heritage	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs	N/A
Ningaloo Coast Strategic Management Framework	• Major potential threats include: resource development. • Management consistent with the objectives and underlying principles of the Ningaloo Coast management system, including Ningaloo Marine Park (Commonwealth), WA Ningaloo Marine Park and Muiron Islands Marine Management Area, Cape Range National Park,	No relevant threats or management actions identified		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
	unallocated Crown land, freehold owners and leaseholders, Learmonth Air Weapons Range Facility.		• SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment	
Commonwealth Heritage Places (refer to Section 7.3.1.2 of EP for additional description of key receptors for each location)				
Scott Reef and surrounds	N/A	N/A	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment	• Seringapatam Reef/Scott Reef (7.8 days)
Ashmore Reef National Nature Reserve	N/A	N/A		• Ashmore Reef (5.5 days)
Mermaid Reef – Rowley Shoals	N/A	N/A		N/A
Ningaloo Marine Area - Commonwealth Waters	N/A	N/A		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
			• SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment	
HMAS Sydney II and HSK Kormoran Shipwreck Sites	N/A	N/A	• SMP: Heritage Features Assessment	N/A
National Heritage Places (refer to Section 7.3.1.3 of EP for additional description of key receptors for each location)				

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
The West Kimberley	N/A	N/A	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment technique (SCAT) • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs	Buccaneer Archipelago (23 days - entrained)
Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves	N/A	N/A		N/A

Receptor	Recovery plan / conservation advice (date issued)	Relevant threats and conservation actions	Relevant OMPs and SMPs	Relevant priority monitoring locations (quickest modelled time to contact[4])
			• SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Social Impact Assessment	
The Ningaloo Coast	Refer to The Ningaloo Coast World Heritage Area			N/A
Shark Bay, Western Australia	Refer to Shark Bay, Western Australia World Heritage Area			N/A
HMAS Sydney II and HSK Kormoran Shipwreck Sites	N/A	N/A	SMP: Heritage Features Assessment	N/A