Airlie Island Remediation Works
Environment Plan Summary

AI-65-RI-10003.1

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1	17/06/16	Issued to DMP	L Muir	S Mavrick	-
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CONTENTS

1. INTRODUCTION

Airlie Island is located 35km NNE of Onslow (refer **Figure 1-1**). The eastern portion of the island has been leased since 1991 to industry to support oil production from offshore fields. Oil production ceased on the island in 2002 and the facilities were mothballed, left in place, and are currently under a care and maintenance programme.

In 2015 field work determined that residues remain in tanks TK-001 and TK-002 comprising hydrocarbon contaminated water and sludge. On the basis that the residual contents within the storage tanks have the potential to be a source of on-going hydrocarbon contamination within the groundwater at the Site, Quadrant is proposing a major maintenance activity that will require the contents of tanks TK-001 and TK-002 to be removed and disposed of at an approved mainland location together with the demolition of the tank structures and off-site recycling of the structural steel.

1.1 Titleholder

Quadrant Northwest Pty Ltd is the titleholder for petroleum activities covered under this EP within Pipeline Licence PL/14 and Production Licence TL/2. For the purposes of this EP it will be referred to as Quadrant Energy.

Titleholder details are as follows:

Name: Quadrant Northwest Pty Ltd

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Telephone number: (08) 6218-7494 (Fred Wehr)

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1.2 Compliance

The overall purpose of the *Airlie Island Remediation Works Environment Plan (AI-65-RI-10003)* (the EP) is to comply with statutory requirements of the Petroleum (Environment) Regulations 2012 and to ensure that the Activity is planned and conducted in line with Quadrant Energy's environmental policies and standards, including the corporate Environmental Policy. The EP was assessed and approved by the WA Department of Mines and Petroleum (DMP) on the 13 June 2016. This EP summary has been prepared in accordance with the requirements of regulation 11(7) of the Petroleum (Submerged Lands) (Environment) Regulations 2012 and the Petroleum Pipelines (Environment) Regulations 2012.

1.3 Schedule

The proposed activity is estimated to take up between 45 and 60 days to complete and is scheduled to commence in June.

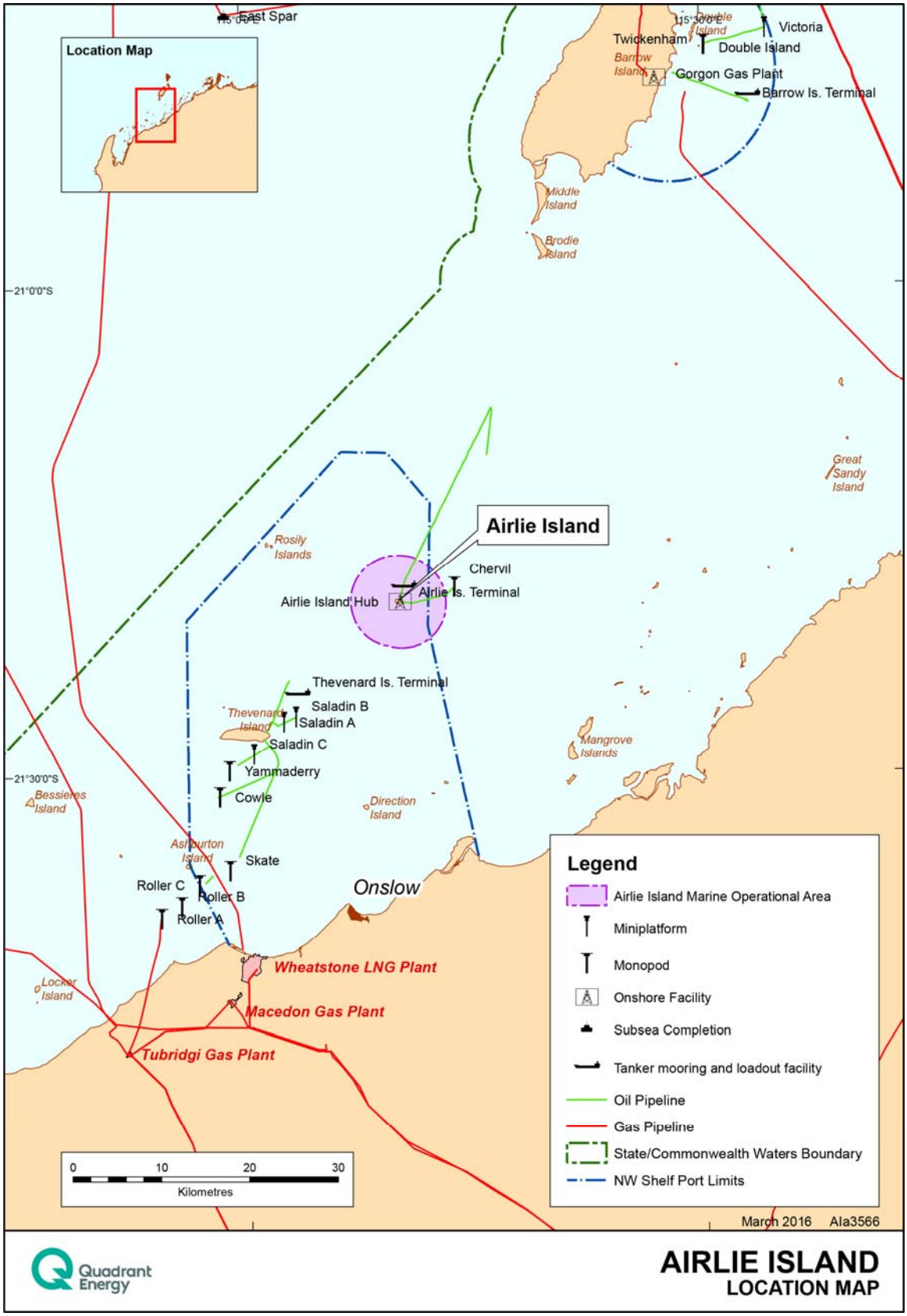

Figure 1-1: Airlie Island regional location

2. ACTIVITY LOCATION

2.1 Location

This EP covers activities that occur under State waters Petroleum Instruments including a Production Licence (TL/2) and the Pipeline licence (PL/14) for the Airlie Island facilities. The distances from AI to key regional features are given in **Table 2-1** and shown in **Figure 2-1.**

Table 2-1: Distance and direction of key regional features from AI

Feature	Distance from Airlie Island
Closest point on mainland	29 km (near Coolgra Point)
Closest Island	15 km (Rosily Islands)
Onslow	34.5 km
Barrow Island Marine Management Area boundary	28 km
Barrow Island	50 km
Dampier	176 km
Exmouth	126 km
Ningaloo Coast	115 km
Muiron Islands Marine Management Area Boundary	82 km
Barrow Island Marine Park boundary	60 km
State/Commonwealth Water boundary	20.5 km

2.1.1 Operational Areas

For the purpose of clarity, separate operational areas within which the activity will take place are defined for marine activities and terrestrial activities as follows:

Marine Operational Area – relevant to all marine activities and includes all water and coastal habitats below the high tide mark within a 5km radius of Airlie Island as indicated in **Figure 2-1**.

Terrestrial Operational Area – relevant to all terrestrial activities within the area indicated on **Figure 2-2** which is the same as that bounded by the Vegetation Clearing Permit application (and within the Airlie Island lease). The terrestrial operational area coordinates are:

Lat	Long
21° 19' 18.87" S	115° 10' 08.72" E
21° 19' 21.33" S	115° 10' 13.41" E
21° 19' 30.67" S	115° 10' 16.26" E
21° 19' 29.30" S	115° 10' 01.80" E
21° 19' 25.28" S	115° 10' 01.83" E
21° 19' 22.89" S	115° 10' 01.88" E

These coordinates are the same as those included for in the vegetation clearing permit.

The lease boundary coordinates are :

Lat	Long
21° 19' 29.08" S	115° 09' 59.45" E
21° 19' 21.33" S	115° 10' 13.41" E
21° 19' 30.67" S	115° 10' 16.26" E
21° 19' 15.34" S	115° 10' 02.01" E
21° 19' 25.28" S	115° 10' 01.83" E

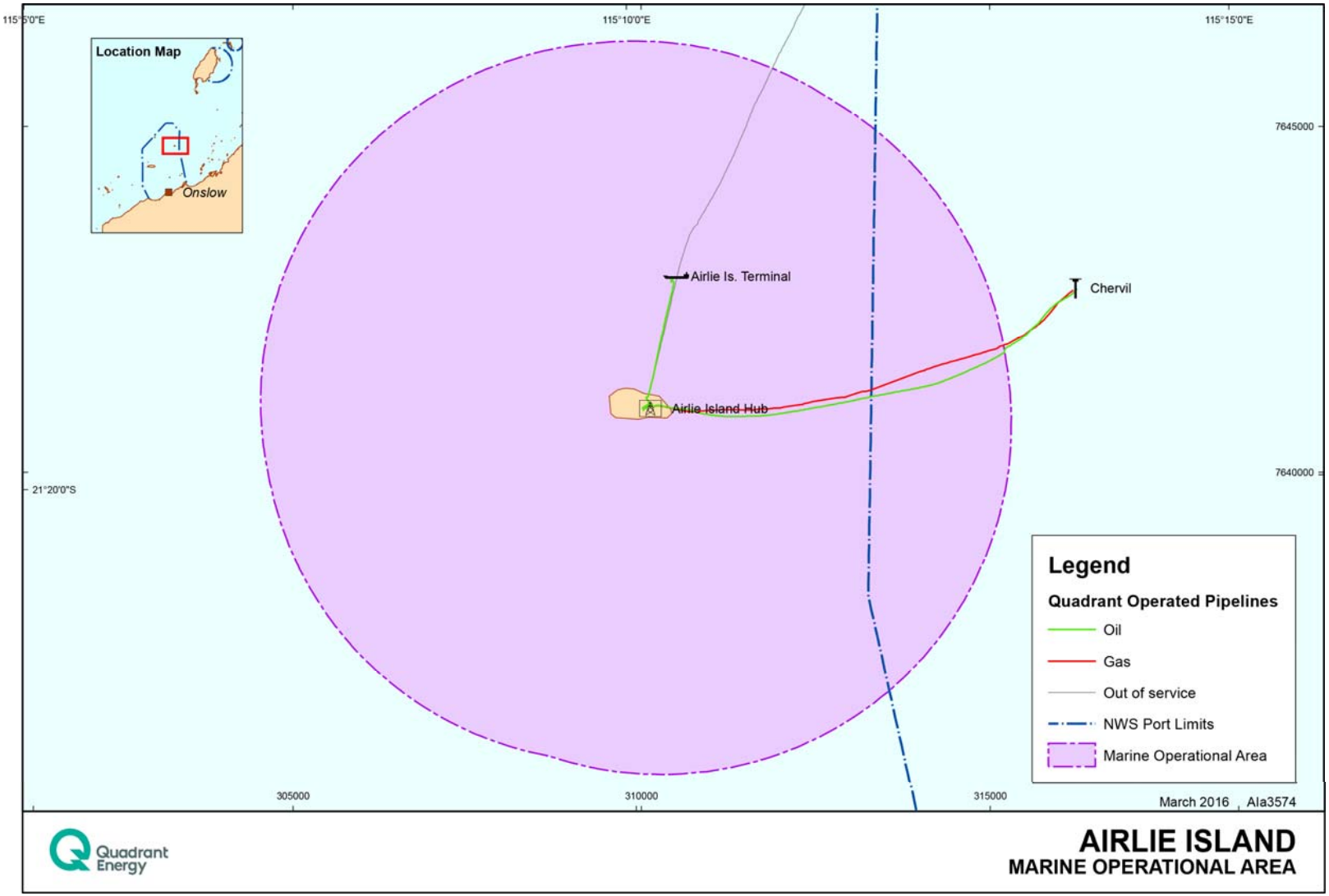

Figure 2-1: Operational Marine Area

Figure 2-2: Airlie Island showing Operational Area boundary for terrestrial activities

3. DESCRIPTION OF THE ACTIVITY

This EP describes works (the 'activity') associated with a Major Maintenance Activity (MMA) targeting tanks TK-001 and TK-002 on Airlie Island. In order to remove the active source of hydrocarbon contamination, the crude storage tanks (TK-001 and TK-002) will need the contents removed, transported from the island and disposed of at an approved mainland location in parallel with the progressive demolition of the tank structures and transportation off-site of the structural steel to the WA mainland.

3.1.1 Terrestrial Operations

The following sections outline the scope of the proposed works on Airlie Island under the Major Maintenance Activity scope. The whole activity proposes to operate 24 hours a day, to enable completion of the activity within the optimised weather window.

Mobilisation and site establishment

Equipment and materials will be mobilised to Airlie Island via Port of Dampier, crew changes will occur from Onslow, using Landing Craft Transport vessels (LCTs) and Accommodation Support Vessel (ASV). Establishment of an LCT landing area (and possible ramp) on the shoreline, and re-establishment of existing access tracks on the island will be completed with some vegetation disturbance and clearing required, along with minimal disturbance to shoreline benthic habitats to safely land LCTs.

Onshore site establishment will include, but is not limited to:

- surveys to identify sensitive ecological receptor areas;
- the setting up of a crib-room, washroom, power, communication, lay down areas and designated refuelling area;
- removal of bird nests at the top of the external stairs on the tanks;
- levelling the tank bund area to make access safe;
- removal of the access man-ways from the tanks; and
- setup of oily water pumping equipment, tank suction lines and delivery hose to the beach staging point.

A landing craft ramp may be required to allow safe access to the beach from the landing craft for equipment and vehicles (preventing contact of vehicles and equipment undercarriage with the beach). The ramp will be approximately 10m wide and the length of the ramp will be determined by the profile of the beach at the time of the activity.

Additionally safe access up the beach will be required. This may include the use of additional stabilisation materials such as bog mats which can be laid down on the sand to provide equipment traction.

Wash water will be brought in from the mainland via LCT.

Oily water removal

Oily water from the tanks will be removed using a pump with a hose running from the tanks onshore to LCTs. The pumping operation duration is less than 24 hours. However, including setting up, connecting hoses, leak testing, swapping between vessel hull tanks (via manifold) and departure of LCTs to suit tides, it is estimated to take approximately 2-3 days to remove the oily water from the tanks on Airlie Island to the storage tanks on the LCTs.

The waste will then be transported to Dampier for discharge to road trains for disposal at accredited onshore facilities. The transport of the controlled waste will be undertaken using a licensed service provider.

Sludge Removal

The sludge will be removed using a remotely operated bobcat inside the tanks to push the sludge towards the clean-out door. The sludge will be vacuumed into sealed sludge bins. The sludge bins will be returned to Dampier via LCT for onward transport (using licensed service provider) by road trains to accredited

disposal/ recycling facilities. Dependant on the sludge properties and ROV efficiencies, it may not be possible to remove all the sludge via bobcat and ROV. Any remaining sludge will be removed once better/ safe access is gained during the demolition activity.

Tank Demolition (upper shells and floating roof)

Following removal of the oily water and sludge, the tanks will be cut down from the top to the first strake using excavators with hydraulic shears, and then the floating roof will be removed. It may not be practicable to remove all the sludge prior to removing the tank tops due to sludge properties, or ROV inefficiencies extending the activity duration. The sludge would be removed following removal of the roof. The steel will be loaded into skips or half height containers and backloaded to a LCT for transport to Dampier for disposal.

Tank Demolition (1st Strake and floor) and removal of contaminated soil

Following the removal of the sludge (that could not be removed via bobcat and ROV), and tank cleaning, progressive demolition of the tanks will continue using excavators with hydraulic shear attachments. The cleaned steel will be loaded into skips or half height containers and backloaded to a LCT for transport to Dampier for disposal. Once the tank has been removed, the potentially contaminated soil under the tanks will be sampled.

The potentially contaminated soil from under the tanks, along with contaminated soil residing in the disused sludge pit, will be recovered and placed in skip bins, for transport back to Dampier. Shallow soil in the sludge pit will be removed and taken off-site for treatment and disposal. The shallow soil under the pit will be removed to reduce contaminant mass. Any further contaminated soil identified using handheld equipment will also be removed. Following removal of contaminated soils a high density polyethylene (HDPE) liner will be installed, prior to backfilling and shaping of the remediation excavation, this will act as a barrier between the overlaying “clean” backfill material and any underlying impacted material which cannot be removed (e.g. due to access / capacity constraints). This barrier is convex in shape and will stop further infiltration of rainfall to the underlying insitu contaminated soil, and to the groundwater until further remediation activities and/ or after all remediation activities have been completed. The HDPE liner will be removed following completion of remediation activities.

All tank contents (oily water and sludge/ corrosion products) will be removed by licensed contractor for treatment/disposal on the mainland at licenced facilities. An investigation into the soil under the tanks will be conducted by an environmental consultant once access is possible (following removal of the tanks). Any localised obvious contaminated soil will be removed and treated as a solid waste. A hand-held Remscan, will then be used across the tank footprint to delineate and map residual hydrocarbons (contamination). Where practicable this material will be excavated. As with the sludge pit, following removal of contaminated soils a high density polyethylene (HDPE) liner will be installed, prior to backfilling and shaping of the remediation excavation, this will act as a barrier between the overlaying “clean” backfill material and any underlying impacted material which cannot be removed (e.g. due to access / capacity constraints). This barrier is convex in shape and will stop further infiltration of rainfall to the underlying insitu contaminated soil, and to the groundwater until further remediation activities and/ or after all remediation activities have been completed. The HDPE liner will be removed following completion of remediation activities. All contaminated soil that is removed will be transferred within skips to the mainland.

Demobilisation

All materials, equipment and waste products will be packed up and back-loaded via LCT to Dampier. The ASV will also demobilise following the departure of LCTs.

3.1.2 Marine Operations

Marine operations are required to;

- provide logistical support to the activity on Airlie Island;
- accommodation for personnel; and

- install and recover temporary moorings.

The indicative vessels, associated roles, and expected presence for the activity are summarised in **Table 3-1**. these vessels may be substituted for a similar vessel due to availability, operational and logistical constraints so as to meet operational needs.

Table 3-1 : Vessels Proposed for logistical support

Vessel	Use
ASV (example Samson Explorer) 35m long x 13m wide	Personnel accommodation, present for the duration of the activity. The accommodation support vessel (ASV) will be moored off a clump weight/ anchor near Airlie Island (agreed with DoT following bathymetry survey). A small tender is located on the back deck on board the ASV.
LCT (example Toll Sandfly) 55m long x 18m wide	Transport of personnel, equipment and waste from Airlie Island to the mainland, in use for the duration of the activity. The LCT will need to make multiple shuttle trips to/from Dampier to Site to mobilise all required equipment progressively. The Landing craft (LCT) will be sailing between Dampier and AI and will be anchored near AI or Dampier when not in use at designated locations (agreed with DoT following bathymetry survey). It will land on the beach to the west of the southern sand spit on AI for loading/unloading, following a shoreline approach route based on bathymetry survey.
2 LCTs for oily water transport (OWT) (example Bhagwan Roller & Bhagwan Mover) Roller: 50 x 16m/ Mover 49 x 13m	The two LCTs to transport the oily water will be landing on the beach to the west of the southern sand spit one at a time and then return to Dampier for transfer of the oily water to licenced waste contractors.
Crew change vessel (CCV) (example Sea Stryder) 20 m long x 6m wide	Used for crew changes and supply runs, present intermittently throughout the activity. The crew change vessel will operate between Onslow and the ASV. It will only be in the vicinity of AI for short duration and will hold its position near the ASV. It is normally based in Onslow.
Crew Transfer vessel (CTV) (example Gopu) 12m long x 3m wide	Used for daily transfers between Airlie Island and ASV, present for the duration of the activity. The crew transfer vessel will be attached to the ASV when not in use and transfer personnel between the ASV and Airlie Island at shift changes. It will land on the beach near the southern sand spit.

3.1.3 Opportunistic Works

Dependent upon resource availability of both personnel and equipment, and within the activity schedule additional works may be undertaken as part of this activity. This may include the draining, flushing and removal of the following equipment associated with the existing facilities on Airlie Island:

Flare Area	Ground flare structure, flare line, fuel gas line and Chervil pipelines from high water mark to separator in process area
Accommodation Area	Accommodation containers and external structures (excluding the light house and solar panels), air conditioners and water tank
Jetty Pylons	jetty pylons and steel grating back to access road
Utility/ Workshop Area	Workshop containers and sheds, pipe storage racks, air compressors and receivers. Power generation and switchboards, diesel tank & water tanks, transfer pumps, RO unit.

	All other loose and fixed items in the area including piping to other areas
Process Area	Lift gas compressor, Separator and Flare KO module including all piping, small skid containing tubing and cross over walkways to adjoining facilities
CPI Water Treatment Area	CPI including piping, pump stations and grating walkway
Export pump Area	export pumps including roof, air receivers, suction piping back to storage tanks, discharge pipeline through tank bund to northern bund wall and stair case in bund

Once the remedial works described in this EP have been completed the infrastructure remaining on the island should be in a stable, and safe state to ensure that future visitation by the public does not pose any safety risk.

2.2.3 Activities not included under this EP

The EP does not include the disposal of contaminated materials once removed from Airlie Island, these are managed by licensed controlled waste contractor who will be disposing of them once they reach the mainland.

4. DESCRIPTION OF ENVIRONMENT

While the area impacted by the planned activity is limited to Airlie Island and the immediate area surrounding the vessels, the worst case potential environmental impact is linked to an unplanned hydrocarbon release, this has been modelled to potentially impact a wider area of up to 45 km from the source. Therefore the wider Environment that May Be Affected (EMBA) is considered when discussing the existing environment.

4.1 Regional Setting

Airlie Island (AI) is located in the North-west Marine Region within the Northwest Shelf Province. This region is characterised by shallow-water tropical marine ecosystems with high species richness. Most of the region's species are tropical and are also found in other parts of the Indian and western Pacific oceans. The southern part of the region is a transition zone between tropical and temperate waters and includes the northern extent of the ranges of some temperate species that are more typical of the South-west Marine Region. High diversity is partly driven by the interaction between seafloor features and the currents of the region. The interaction of seafloor features and oceanographic processes also supports unique ecosystems and associated trophic interactions and communities.

Key features of the North-west Marine Region are the Ningaloo Reef and North West Cape to the southwest of AI, the Montebello/Barrow/Lowendal islands to the north east of AI and the Dampier Archipelago/Burrup Peninsula to the north east of AI.

Barrow Island, the Lowendal Islands (including AI) and the Montebello Islands are part of a shallow submarine ridge, which extends north from the mainland near Onslow. The ridge contains extensive areas of intertidal and shallow subtidal limestone pavement surrounding the numerous, mostly small islands which are found in the region. The seabed is primarily less than 5 m deep and consists of sand veneered limestone pavement with patches of fringing coral reef.

Airlie Island is also situated in the Interim Biogeographic Regionalisation for Australia (IBRA) Carnarvon Biogeographic region, within the Cape Range subregion (CAR1). In addition to the mainland area surrounding Cape Range, key values of this subregion include Exmouth Gulf Islands, Muiron Islands, Lowendal Islands, Montebello Islands and Barrow Island.

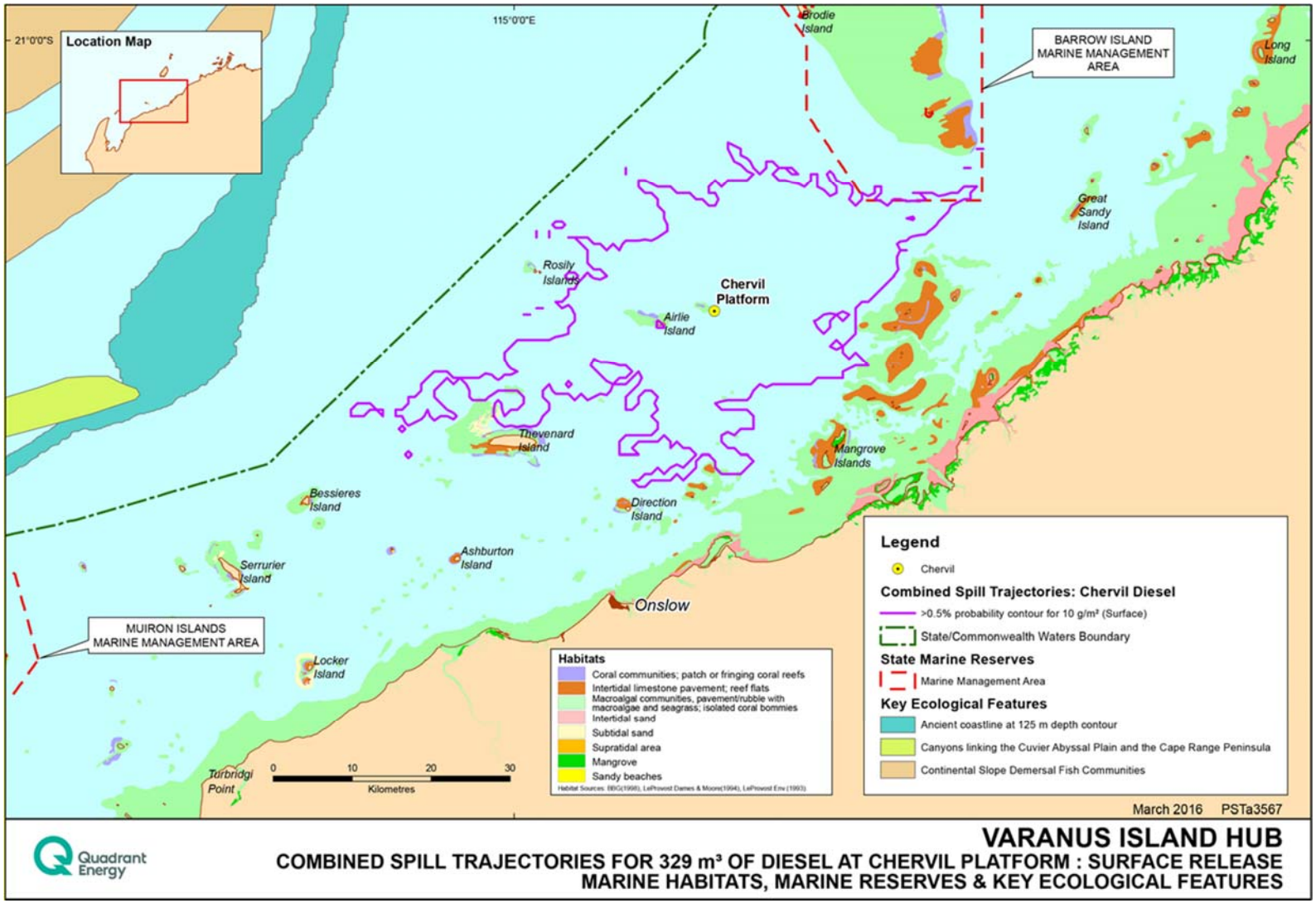

Figure 4-1 EMBA based on modelled spill trajectories for all seasons for floating diesel (>10 g/m^2), resulting from surface release of 329m^3 diesel at Chervil Platform in relation to Airlie Island

4.2 Marine Environment within EMBA

4.2.1 Marine habitats

Airlie Island (AI) is 860 m long (dependent on the formation of the spit on the eastern side of the island), 460 m wide at its widest point and is 11.5 m above sea level at its highest point. Topography is characterised by ground sloping gently towards the north, east and southeast. This section provides an overview of the marine environment in the vicinity of Airlie Island.

Value	Description
Seagrass	• The main seagrasses of the region are small, ephemeral species that grow on soft sediments and have a seed bank in the surficial sediments that allows them to recover quickly from disturbance. • Seagrass distribution is restricted to shallow areas with sufficient light availability for photosynthesis; seagrasses are uncommon in waters deeper than 30 m. • Seagrasses in the Montebello/Lowendals/Barrow Island region do not form extensive meadows but rather are sparsely interspersed with macroalgae. • No seagrasses have been identified in benthic surveys around AI.
Macroalgae	• Macroalgae are most prolific over shallow pavement limestone reefs adjacent to offshore islands. • Macroalgae are the dominant macrophyte in the Montebello/Lowendal/Barrow island region occupying approximately 40% of the benthic habitat area of the region (CALM, 2004). The most numerically abundant macroalgae are the species of Sargassum that cover the shallow subtidal rock platforms around the islands. • At least 132 macroalgal taxa occur in marine habitats around Barrow Island with most thought to be distributed widely in the tropical Indo-Pacific region (Huisman pers. Comm., in Chevron, 2005). • Subtidal environment around AI is predominantly macroalgal habitat to approximately 10 m depth.
Hard Corals	• Approximately 6% of the Montebello/Barrow Islands marine conservation reserves are comprised of shallow intertidal and subtidal reef communities. • Quantitative sampling of seven sites around the Lowendal Islands showed a range of 34 to 63 species or taxa per site, with massive forms such as Favites and Porites, and tubular and digitate species of Acropora dominating the assemblages (LeProvost Dames and Moore, 1994). No corals are present in the channel between the Lowendal Islands and the northern tip of Barrow Island. A small submerged fringing reef lies in shallow water on the northeast side of Barrow Island. • Coral habitats of greater than 5% cover are present along the seaward boundaries to the west, north and northwest of the limestone platform of AI. The percentage cover of coral in these areas is patchy varying from 5% up to as high as 10 – 20%.
Mangroves	• Mangroves occur in the Montebello and Lowendal islands, along the south eastern and southern shores of Barrow Island, eastern beaches of Bridled Island and western beaches on VI, in sheltered pockets on the offshore islands of the Dampier Archipelago, western side of the Cape Range Peninsula, western shore of Exmouth Gulf and in extensive stretches along many creeks and watercourses on the mainland coast. • No mangroves gave ben identified on AI.
Rocky Substrata	• Rocky substrate may be either subtidal (e.g. low relief pavement or high relief reef) or intertidal (i.e. platforms and rocky shorelines). Rocky substrata are found around offshore islands or on the mainland of the NWS.
Sand	• Sandy areas may occur subtidally with or without sessile epibiota such as seagrasses, some algae species and sessile invertebrates (e.g. sea pens and anemones). • Sandy beaches are an important habitat for nesting sea turtles on the NWS, including beaches of the Ningaloo coast, Muiron Islands, Montebello/Barrow/Lowendal Islands and the Dampier Archipelago, with some beaches critically important for populations of certain sea turtles species. • Sand habitats surround the limestone reef around AI at depths of around 10-12 m.

4.2.2 Marine Fauna

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) lists threatened and migratory fauna species that are protected under Commonwealth legislation and various international conventions and treaties. A search of the EPBC Act Protected Matters Database was conducted on 26/11/2015 using a 45-km radius search area from a central location coordinate on Airlie Island.

Value	Description
Invertebrates	• Pelagic invertebrates other than zooplankton include mobile cnidarians (jellyfish) and squid are expected to occur around AI • The infauna assemblages observed during surveys around AI and VI (IRCE, 1999) were typical of benthic infaunal communities occurring elsewhere on the NWS. They were dominated by polychaete worms and crustaceans, and represented by a diverse range of other taxa at lower abundances • The study concluded that, on a regional scale, natural local processes rather than effects of petroleum production activities influenced infaunal assemblages
Fish and sharks	• 9 species of fish and sharks listed as threatened and/or migratory under the EPBC Act could occur within the 45 km radius of AI • Whale sharks are occasionally observed from Quadrant's offshore oil and gas facilities and drill rigs offshore from Varanus Island (e.g. Harriet Alpha platform).
Marine Reptiles	• Seasnakes are frequently observed in the surrounding waters of VI. The most common seasnake sighted in the waters surrounding VI is the olive sea snake (Aipysurus laevis). • 1 sea snake listed as threatened under the EPBC Act could occur within the 45 km radius of AI, although it has not been recorded in AI waters to date. • Five turtle species listed as threatened and/or migratory under the EPBC Act could occur within the 45 km radius of AI. • It is estimated that regionally (North West Shelf), Airlie Island supports 0.2% of green, 0.3% of flatback and 1.1% of hawksbill nesting activity (Pendoley 2015). • On Airlie Island, there has been nesting activity recorded for flatbacks as early as October and as late as February, and anecdotal records of green or hawksbill tracks on beaches in May to August.
Marine Mammals	• 10 species of marine mammals listed as threatened and/or migratory under the EPBC Act could occur within the 45 km radius of AI. • A number of marine mammals are known to occur in the local region around AI, including dolphins, whales and the dugong. Some species are seasonal visitors, migrating through NWS waters, while others occur all year round. • Of the marine mammals listed in the EPBC search, dugongs are the species identified as most likely to occur around Airlie Island, having been sighted in the shallow water. While it is likely the species would be feeding on seagrass, previous benthic habitat surveys of Airlie Island did not identify any significant seagrass habitats (Cardno, 2011) surrounding Airlie Island.
Seabirds	• 13 species of birds listed as threatened and/or migratory under the EPBC Act could occur within the 45 km radius of AI. • Bird species that nest on AI are discussed in **Section 4.3.2**, however the southern giant petrel may occur in the vicinity given its migratory natural range.

4.2.3 Marine Protected Areas

There are no marine protected areas within the operational area, however the Montebello and Barrow Islands Marine Conservation Reserve is overlapped by the EMBA. The ecological and conservation values of the Montebello and Barrow Islands marine conservation reserve include important habitats including corals reefs and bommies, mangroves, seagrass and macroalgae meadows, rocky shorelines and hard substrate, intertidal sand and mudflat communities. These habitats provide protection, food and habitat for

a large diversity of species, including dugongs, turtles, whales, other protected cetaceans and birds as well as seasnakes and fish. The area is considered to have a high biodiversity.

Socio-economic values of the Montebello and Barrow Islands MCR include hydrocarbon exploration and production, pearling, nature-based tourism, commercial and recreational fishing, water sports, European history and maritime heritage and scientific research (DEC, 2007).

4.2.4 Marine Key Ecological features

No KEFs are overlapped by the terrestrial or marine operational areas, or contained within the EMBA.

4.3 Terrestrial Environment within EMBA

4.3.1 Terrestrial Habitats

Annual vegetation monitoring began in 1987 and continues to occur and is currently undertaken by Astron Environmental Services to meet the requirements of conditions relevant to Lease 1901/100. Long-established transects and quadrats are used to compare species diversity and abundance from year to year. Weed cover is also monitored during these trips, and in the past weeding trips were undertaken on an opportunistic basis (following rainfall events) to control weed outbreaks.

Value	Description
Native Vegetation	• No Wildlife Conservation Act-listed rare flora or Department of Parks and Wildlife (DPaW) - listed priority flora (WA Government Gazette, 2012b) are known to occur on the island • There are also no Threatened Ecological Communities or Priority Ecological Communities present as described by DPaW. There are no defined watercourses or wetlands on AI.
Weeds	• In May 2015, two weed species (buffel grass and kapok) and three mainland introductions were identified. • No species on AI is listed as a declared pest under the Biosecurity and Agriculture management Act 2007 (Department of Agriculture and Food 2014) or as a listed Weeds of National Significance (Australian Weeds Committee 2012).

4.3.2 Terrestrial Fauna

Airlie Island is known as a nesting area for a number of seabird species, there are also terrestrial reptiles recorded on AI. There are no native mammals known from Airlie Island.

Value	Description
Nesting Birds	• 22 avifauna species listed as migratory or marine under the EPBC Act have been recorded in the AI vicinity. No species recorded from AI are listed as threatened under the EPBC Act. • Annual surveys conducted by Quadrant have recorded 6 bird species consistently nesting on AI, and an additional 3 species that nest nearly every year but move sites and may skip seasons from time to time (Halfmoon Biosciences, 2015). • Tern species nest close to the vegetation/beach boundary along south eastern 'spit', to the west of the tank infrastructure, and on the north of the island. • The silver gull nests within the vegetation to the south west of the existing infrastructure, and outside the lease area. • Ospreys are known to nest on the tank infrastructure as well as other locations on Airlie Island. • Sea eagles also use locations outside the lease area.
Terrestrial Reptiles	• At least three species of reptiles have been recorded from Airlie Island. • One species of terrestrial reptile, the Airlie Islands Skink, is listed as Vulnerable under the EPBC Act and Threatened under the Wildlife Conservation Act. This skink is a diurnal species feeding on invertebrates.

Value	Description
	• The most recent study by Surman and Nicholson (2011) estimated a population of approximately 40 individuals at the time. • Surman and Nicholson (2011) found that Airlie Island Skink prefer the western side of the island, but were also found elsewhere.

4.3.3 Terrestrial Protected Areas

The only terrestrial conservation reserve that has the potential to be impacted from terrestrial operations is Airlie Island Nature Reserve, which also has the potential to be impacted by marine operations.

Airlie Island reserve is a 'C' class nature reserve (Reserve 40323, Crown Lease 1901/100) vested in the Conservation Commission of Western Australia and managed by the Department of Parks and Wildlife (DPaW).

One other terrestrial conservation reserve, Thevenard Island Nature Reserve, is present within the wider EMBA. Only shoreline habitat within this reserve may be impacted due to unplanned marine events defining the EMBA. Thevenard Island is a class C nature reserve and its shorelines provide significant seabird and green and flatback turtle nesting habitat.

4.4 Cultural Environment

No ethnographic or archaeological sites are listed for AI and no records of Aboriginal occupation have been recorded for AI or the surrounding marine waters. There are no Native Title claims that exist over AI. There are no shipwrecks located in the immediate vicinity of AI.

4.5 Socio-economic Environment

Value	Description
Population Centres	• The operational area is 29 km away from the nearest landfall on the mainland, and the nearest town is Onslow (34.5 km south). • Karratha, Dampier, Exmouth and Port Hedland are the main service and population centres for the region. • Smaller coastal and fishing towns are Exmouth, Onslow and Point Samson.
Fisheries	• The marine operational area overlaps with four Commonwealth fisheries, the fisheries concerned are unlikely to be active in the area. • Waters within the operational area are closed to trap and trawl fisheries. • The Onslow Prawn, Pearl Oyster fishery and Pilbara Trawl and Trap Managed Fishery are shown to occur within the marine operational area. owever, there are no pearling leases within the operational area boundary, and the Onslow prawn fishery is not active in that. The Pilbara trawl and trap are both closed within the operational area.
Tourism and Recreation	• Tourism in the areas surrounding AI is largely limited to nature-based tourism in the adjacent marine reserves. • Tourism and recreational activities in the local area include SCUBA diving, snorkelling, fishing, mud crabbing, wildlife appreciation, island exploring and a limited amount of surfing. • Visits to AI are rare due to managed access restrictions.
Petroleum Industry	• All petroleum related activity within both the terrestrial and marine operational areas is Quadrant operated. The closest non-Quadrant operating petroleum field is Thevenard Island, operated by Chevron Australia Pty Ltd. Neither the terrestrial or marine operational area will overlap with Barrow Island activity.
Shipping	• The proposed marine operational area does not overlap any major shipping fairways. Increased

	traffic is observed traversing the south of the marine operational area approximately 3 km from Airlie Island. • Airlie Island is within Onslow Port waters but is approximately 35 km from port.

5. STAKEHOLDER CONSULTATION

Quadrant recognises that its activities have the potential to impact the community and the environment, particularly in locations which feature or are near sensitive receptors, or that overlap with other economic, cultural or community uses.

To facilitate informed assessment by stakeholders of the likely potential impact of Quadrant activities, Quadrant seeks to establish long-term and meaningful dialogue with those stakeholders who have an interest in its present and planned future activities in Australia.

Quadrant clearly articulates engagement and consultation standards, goals, and mechanisms, seeks to effectively manage change during the life of its projects and activities, and strives to continuously improve all aspects of its stakeholder engagement processes. The key stakeholders identified for the activity are based on the operational area and EMBA and are provided in **Table 5-1**.

Table 5-1: Summary of Key Stakeholders Consulted for the Activity

Group	Stakeholder
Commercial fisheries	• A Raptis and Sons • Austral Fisheries • Australian Fisheries Management Authority (AFMA) • Australian Southern Bluefin Tuna Industry Association (ASBTIA) • AMB Holdings • Commonwealth Fisheries Association (CFA) • Department of Fisheries (DoF) • Fat Marine/Coral Park Seafoods • MG Kailis • Pearl Producers Association • Quest Maritime Services • RNR Fisheries • Shark Bay Seafoods • Western Australian Fishing Industry Council (WAFIC) • WestMore Seafoods
Recreational fisheries	• Marine Tourism WA (formerly Charter Boat Association) • Recfishwest
Conservation	• Department of Parks and Wildlife (DPaW) • Department of Environmental Regulation (DER) • Marine Parks and Reserves Authority (MPRA)
Marine activities, spill response and safety	• Australian Marine Oil Spill Centre (AMOSC) • Australian Maritime Safety Authority (AMSA) • Department of Defence (State) • Department of Environment (Federal) • Department of Mines and Petroleum (State) • Department of Transport (State)

Exmouth Stakeholder Reference Group (SRG)	• Cape Conservation Group • Department of Parks and Wildlife (Exmouth) • Department of Transport (Exmouth) • Exmouth Chamber of Commerce and Industry • Exmouth District High School • Exmouth Visitors Centre • Federal Member of Parliament • Gascoyne Development Commission • Member of the Legislative Assembly • North West Cape Exmouth Aboriginal Corporation • Ningaloo Station • Shire of Exmouth Administration • Shire of Exmouth Council • Toll Exmouth (Exmouth Freight) • Ningaloo Coast World Heritage Advisory Committee
Karratha/Dampier and Port Hedland stakeholders	• City of Karratha • Pilbara Development Commission • Pilbara Port Authority • Town of Port Hedland
Onslow stakeholders	• Onslow Chamber of Commerce and Industry • Onslow Port Authority (and Pilbara Port Authority) • Onslow Tourist Information Centre • Shire of Ashburton

Quadrant maintains a comprehensive stakeholder database, which is overseen by a dedicated Consultation Coordinator. The purpose of the database is to enable the identification, initial and ongoing contact with an appropriate group of stakeholders for any given project, and to facilitate the building of long-term and meaningful dialogue with those stakeholders with whom Quadrant has regular contact.

Quadrant's planned maintenance activities at Airlie Island was included in the March 2016 Quarterly Project Update, distributed to all stakeholders in **Table 5-1** on March 10, 2016. Details provided regarding the activity include map, estimated duration and return contact details should stakeholders wish to receive further information on the proposal. No concerns or queries regarding maintenance at Airlie Island have been raised through this method of consultation.

5.1 Addressing consultation feedback

Quadrant's Consultation Coordinator is available before, during and after completion of the proposed activity to ensure opportunities for stakeholders to provide feedback are available. Consultation feedback is provided to relevant activity personnel to ensure the Quadrant Energy business has a thorough understanding of how the activity is being received by relevant persons.

5.2 Summary

Assessment of the activities covered under this EP showed there would be no additional risk or impact to stakeholder's functions, interests and activities as all activities will be occurring within Quadrant's lease for a short duration.

Quadrant believes consultation for this activity has been sufficient. Early consultation included the Department of Environmental Regulation (DER) in conjunction with the Contaminated Sites Auditor (CSA), as well as consultation with the Office of the Environmental Protection Authority (OEPA), the Department

of Mines and Petroleum (DMP), the Department of Parks and Wildlife (DPAW) and the Department of Transport (DoT). Additionally consultation by means of Quarterly Consultation Update captured Quadrant's wider stakeholder database.

Selected stakeholders were consulted during the development of this EP. Input from the OEPA, DPaW, DER, the DMP and the DoT was valuable in the production of the EP, and results of consultation found the proposed activity would be unlikely to have significant environmental impacts. Each of these stakeholders were given sufficient time to assess information presented to them in consultation, and raised no concern with this activity.

Quadrant is aware presence on the island during the activities may interest local stakeholders, as such ongoing consultation with community will be undertaken in line with Quadrant's Stakeholder Consultation Strategy (AE-91-RG-10002). Maintenance activities will not impact local stakeholders, given access to Quadrant lease area is prohibited and the remainder of the island is restricted to recreational day use only as Airlie Island is vested as Nature Reserve 40323 and managed by DPaW. Ongoing consultation will account for vessels on location during the activity. This has been supported through consultation with Recfishwest prior to activity commencement.

3rd party access to Airlie Island itself was risk assessed as a health and safety risk, as such Quadrant Energy's has erected signage advising of the risk of entering the lease area. The presence of the project machinery on Airlie Island will also provide a much more visible and audible notification of activity to any visitors to the island and should deter people from entering the lease area.

All correspondence with external stakeholders is recorded in the stakeholder database. Quadrant's Stakeholder Coordinator is available before, during and after completion of the proposed activity to ensure opportunities for stakeholders to provide feedback are available. Consultation material is provided to relevant activity personnel to ensure the Quadrant business has a thorough understanding of how the activity is being received by relevant persons.

6. ENVIRONMENTAL HAZARDS AND CONTROLS

The impact and risk assessment approach is consistent with the requirements of AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines and ISO/IEC 31010 Risk management – Risk management techniques. The key steps are illustrated in **Figure 6-1**.

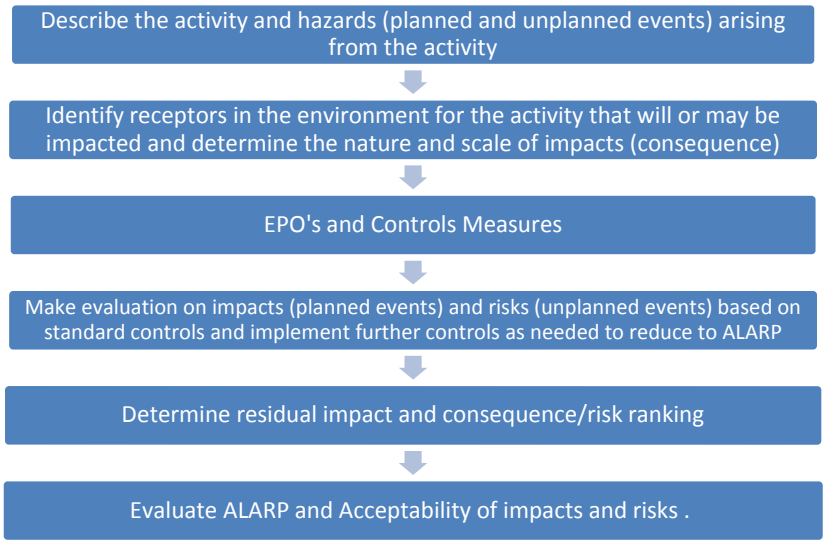

Figure 6-1: Risk and Impact Process

An assessment against the Activity was undertaken and the environmental hazards or aspects were then identified. The risk assessment identified 12 potential unplanned events and 11 planned events. Environmental aspects/hazards (and associated residual risk) identified for the Activity are summarised in **Table 6-1.**

The extent of actual or potential impacts from each planned or unplanned event is assessed using, where required, modelling (e.g. for hydrocarbon spill modelling) and scientific reports. Impact mechanisms and any thresholds for impact are determined and described, using scientific literature and modelling where required. This step looks at the causal effect between the aspect/hazard and the identified receptor. Impact thresholds for different critical life stages are also identified where relevant.

The consequence level of the impact is then determined for each planned and unplanned event based on the severity of the impact to relevant receptors. This process determines a consequence level based on criteria set for Quadrant for each receptor category and takes into consideration the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem or industry level. The consequence definitions are outlined below. In addition to the consequence assessment for the planned events – where the potential hazard is expected to occur, using the *Quadrant Risk Matrix* (AE-91-IF-039) the residual risk ranking is described. The residual rankings (with management controls implemented) are all ALARP, based on a likelihood ranking of "Expected".

Consequence Level		Consequence Level description
A	Negligible	No impact or negligible impact.
B	Minor	Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect with rapid recovery
C	Moderate	Significant impact to local population, industry or ecosystem factors. Medium term recovery
D	Major	Major long-term effect on local population, industry or ecosystem factors. Slow recovery over decades

E	Critical	Complete loss of local population, industry or ecosystem factors AND/ OR major wide-spread regional impacts with slow recovery.

For unplanned events, a risk ranking is also determined using an assessment of the likelihood (likelihood ranking) of the event as well as the consequence level of the potential impact should that event occur.

For each planned and unplanned event a set of Environmental Performance Outcome(s), Environmental Performance Standards and Measurement criteria are identified. The definitions of the performance outcomes, standards and measurement criteria are consistent with the Petroleum (Environment) Regulations 2012. For planned and unplanned events, an ALARP and Acceptability assessment is also undertaken.

6.1 ALARP and Acceptability Evaluation

For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that the standard control measures adopted reduce the consequence or risk to as low as reasonably practicable (ALARP). This process relies on demonstrating that further potential control measures would require a disproportionate level of cost/effort for the consequence or risk. If this cannot be demonstrated then the further controls are implemented. The level of detail included within the ALARP assessment is based upon the nature and scale of the potential impact and risks.

In order to determine whether planned impacts arising from a petroleum activity are of an acceptable level, Quadrant has set limits where the environmental consequences of the planned impacts are viewed as acceptable or unacceptable. Given the complexity of ecosystems (in terms of ecosystem components and their interactions), consequence is difficult to quantify but can be expressed qualitatively based on the scale of the impact, the level of change to ecosystem/population function and the time taken for recovery of the ecosystem/population. It is considered that within the natural environment, some aspects have a higher value than others, and these aspects, or sensitive receptors, have been specifically considered when determining the overall environmental consequence of an impact. Consequence levels for the following sensitive receptors have been determined for all planned impacts. Should the consequence level for any one of these sensitive receptors be assessed as unacceptable, the event leading to the impact cannot progress as planned.

Table 6-2 summarise the identified hazards and the residual risk rankings (and consequence rankings for planned impacts). **Table 6-3** summarises the potential impacts, risks and control measures for planned events and **Table 6-3** summarises the potential impacts, risks and control measures for unplanned events.

Table 6-1: Summary of the environmental risks for terrestrial and marine activity

Hazard	Residual Risk Level	Final Consequence Ranking
Planned events - Marine Activity		
Light emissions	ALARP	Acceptable
Noise emissions	ALARP	Acceptable
Atmospheric emissions	ALARP	Acceptable
Interactions with other marine users	ALARP	Acceptable
Operational discharges (marine)	ALARP	Acceptable
Disturbance to benthic habitats (mooring / anchoring)	ALARP	Acceptable
Planned events - Terrestrial Activity		
Light emissions	ALARP	Acceptable
Noise emissions	ALARP	Acceptable

Atmospheric emissions	ALARP	Acceptable
Operational discharges	ALARP	Acceptable
Disturbance of land and native vegetation	ALARP	Acceptable
Hazard		**Residual Risk Level**
Unplanned events - Marine Activity		
Introduction of invasive marine species		ALARP
Vessel interactions with marine fauna		Tolerable
Disturbance to benthic habitats		Tolerable
Accidental discharge – Non – hydrocarbon release solids and liquids		Tolerable
Accidental release contaminated materials from removal of infrastructure		Tolerable
Accidental discharge – Hydrocarbon release		Tolerable
Unplanned events - Terrestrial Activity		
Spread of non-native flora or fauna		Tolerable
Accidental Fire		ALARP
Collision or injury to fauna		ALARP
Accidental discharge – Non hydrocarbon release of solids and liquids		ALARP
Accidental release contaminated materials		ALARP
Accidental discharge – Hydrocarbon release		Tolerable

Table 6-2: Potential Impacts Risks and Control Measures

Event	Potential Impacts	Management Controls
Marine		
Light Emissions	Disturbance to marine fauna from artificial lighting	Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Support vessels and accommodation vessel will adhere to the following lighting requirements: • Lighting directed towards water or land is minimised • The minimum light level required (e.g. switch off non-essential lighting) Induction includes requirement that curtains are drawn at night time in the crew mess and associated onshore offices, unless in an emergency. Induction includes requirement that curtains are drawn at night time where practicable on the support vessels, unless required for safety or in an emergency, to minimise light spill. Signs of nesting fauna shall be checked for daily within the project area and project boundary. Should signs of nesting fauna be found, additional controls shall be implemented if possible. Use of minimum lighting required for safe operations. The minimum light level required (e.g. switch off non-essential lighting) and lights will be directed away from surrounding areas and directed only with project area so no direct light spill onto surrounding beaches, ocean and other terrestrial areas. Project inductions, noticeboards and pre start meetings shall include lighting requirements and shall be regularly advocated throughout the activity.
Noise Emissions	Noise generated during the activity may result in behavioural impacts to marine fauna.	Activity scheduled to occur between June – August, outside of sensitive peak turtle and shearwater nesting periods. Procedures for interacting with cetaceans : In accordance with Part 8 of EPBC Regulations (Vessels), all vessels must travel at less than 6 knots within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area. Vessels maintain approach distances to marine fauna of, 150 m radius for dolphins and 300 m for whales as stipulated in Quadrant Interactions with Marine Fauna Procedure. Vessels will be anchored / moored reducing noise where practicable. Bridge watch for marine fauna (including dugongs) during vessel movements by vessel crew. Marine fauna identification posters and Marine Fauna Sighting Datasheets to be made available on board all vessels (except personnel transfer vessel). Educational awareness on marine fauna for project personnel through environmental vessel inductions prior to vessel mobilisation. Vessels and equipment maintained in accordance with preventative maintenance system (PMS) schedule.

Event	Potential Impacts	Management Controls
Atmospheric Emissions	Air emissions may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point.	Sulphur content of fuel oil complies with Regulation 14 of MARPOL Annex VI. Vessels to have valid MARPOL/ AMSA certification or equivalent for applicable equipment including incinerator (vessels) and engines. If vessel has incinerator, Incinerator operated in accordance with Regulation 16 of MARPOL Annex VI. Ozone-depleting substances (ODS) managed in accordance with Regulation 13 of MARPOL Annex VI. Machinery maintained in accordance the PMS.
Interactions with other users of the sea	Disruption to commercial shipping, fishing activities and other marine users.	Marine user notifications : Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation to the operational area, which may trigger AHO to issue a 'Notice to Mariners'; AMSA RCC notified of operational area, activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning; Stakeholder notifications. Vessels will be fitted with collision avoidance radar (in accordance with class requirements) and radio to facilitate detection and enable communications between project vessels and commercial/3rd party vessels. Project vessels will have a 5 knot speed limit within 500m of the island, where vessel activity will be focussed, and there is shallow bathymetry
Operational Discharges	Reduction of marine water quality from planned (operational) discharges	Vessels to have current and valid class survey certificate indicating the vessel meets standards for operating in Australia. Vessels to have MARPOL certification (or equivalent) for applicable equipment including sewage system and garbage management. Standard Operating Procedures (SOPs) are in place to manage discharges. Sewage will only be discharged in AI Port limits in accordance with DoT Exemption. Sewage system compliant with Regulation 9 of MARPOL Annex IV. Sewage system maintained in accordance with PMS. No discharge of food waste within Operational area. Only non-hazardous, biodegradable detergents used for deck washing as per MARPOL. Bunding under hydrocarbon containing equipment. Water treatment system maintained in accordance with planned maintenance system. No discharge of oily water in line with MARPOL within port limits. Stakeholder engagement with relevant parties.

Event	Potential Impacts	Management Controls
Disturbance to Benthic and Beach Habitats	Disturbance to benthic and beach habitats from marine operational activity	Temporary mooring installations and anchoring locations will be designated where deemed most suitable to avoid sensitive habitat locations as determined by bathymetry survey . Recovery of temporary moorings and markers in approach area around reef Mooring analysis carried out by vessel operator of ASV to ensure stability of mooring arrangements within designated anchoring and mooring locations as determined from bathymetry survey. Notifications to DoT of proposed mooring installations and anchoring locations. Initial transit of LCT approach to the beach during daylight hours. Vessel approach channel defined from bathymetry survey to avoid sensitive habitat locations2. Installed moorings retrieved from seabed. Weather limits for approach at discretion of vessel Master
Terrestrial		
Light Emissions	Disturbance to fauna from night time artificial lighting.	Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Induction includes requirement that curtains are drawn at night time in the crew mess and associated onshore offices, unless in an emergency. Environmental Management Plan will contain lighting mitigation measures including; • Use of minimum lighting required for safe operations (e.g. switch off non-essential lighting), • selecting appropriate wavelengths (use turtle friendly lights), and • lights will be directed away from surrounding areas and directed only with project area so no direct light spill onto surrounding beaches, ocean and other terrestrial areas. Use of deterrents installed at least 4 weeks prior to commencement of activity to discourage nesting in operational area. Heliport lighting is switched off at night unless required for use as per Civil Aviation Safety Authority (CASA) requirements. Signs of nesting turtles on beaches (operational area) shall be checked for daily. Should signs be found, additional controls shall be implemented if possible, such as: • Ensuring no direct lighting during fledgling/hatching timings on identified location • Ensure personnel are alerted of sensitive location Demarcate sensitive locations with barricades (e.g ropes). Project inductions, noticeboards and pre start meetings shall include lighting requirements and shall be regularly advocated throughout the activity.

Event	Potential Impacts	Management Controls
Noise Emissions	Disturbance to fauna due to noise.	Activity scheduled to occur between June – August, outside of sensitive peak turtle and shearwater nesting periods. Removal of osprey nest from the top of the tanks (Regulation 15 of Wildlife Conservation Act), alternative nesting areas elsewhere on island. Use of deterrents installed at least 4 weeks prior to commencement of activity to discourage nesting in operational area. Active management of nesting birds - checking for nests in lay down areas and all areas to be cleared/disturbed. Equipment maintained in accordance with preventative maintenance system (PMS) schedule. Generators have sound protection.
Atmospheric Emissions	Air emissions may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point.	Equipment maintained in accordance with preventative maintenance system (PMS) schedule.
Disturbance to terrestrial habitat and associated flora and fauna	Disruption to commercial shipping, fishing activities and other marine users.	In accordance with AI Lease 1901/100 Clause 1 (35) No access outside the AI lease area is permitted unless approval has been obtained from DPaW and Clause 1(15) No construction, operations or works or creation of disturbance whatsoever on the Reserve outside of AL lease area. Use of accommodation support vessel located offshore of the Island rather than set up new accommodation camps on Airlie Island. Use of designated lay down areas only and utilisation of previously marked tracks wherever possible. No work areas outside of vegetation clearing permit boundary to limit vegetation disturbance and prevent weed spread. Spotters ahead of any machinery movement where habitat will be disturbed initially. Use of deterrents to discourage nesting in operational area prior to commencement of activity. Reinstatement of the beach profile so that no ruts or pits are present. Twice daily inspection of beach access area to ensure altered topography of beach will not present a hazard to fauna Active management of nesting birds - checking for nests prior to designation of lay down areas and all areas to be cleared/disturbed by on-site zoologist during site-setup. Management of terrestrial and avian fauna as required by the Fauna handling licence (Regulation 15 of Wildlife Conservation Act). Educational awareness through workforce induction which includes information and management of sensitive fauna / flora, the activity boundaries (operational area and the lease area), and the vegetation clearing permit conditions.

Event	Potential Impacts	Management Controls
		A Vegetation Clearing Permit (6972/1) will be in place and adhered to for any activities that could disturb or will clear native vegetation within the Lease areas on AI (clearing not to exceed 2.89 hectares.) Where practical lay-down areas located in previously disturbed areas. Pre-determined alternative lay down areas have been identified in the vegetation clearing permit. Vegetative material and soil removed by stockpiled and retained. Delineation of the vegetation clearing areas and intended work areas. In accordance with NVCP 6972/1 minimise spread of weed by: • Cleaning earth moving machinery of soil and vegetation prior to entering and leaving area to be cleared • No weed affected soil, mulch, fill is brought into area to be cleared • Movement of machines and other vehicles restricted to clearing boundaries. Vegetative material and soil removed by stockpiled and retained. Within 12 months of clearing, re-vegetate and rehabilitate purpose cleared areas no longer required by: • Reshaping land surface so it is consistent with surrounding 5m of uncleared land and • Lay previously retained vegetative material topsoil. Maintain record of activity (clearing and re-vegetation/ rehabilitation) including where relevant: • Location of all clearing undertaken to GDA Australia 1994 • Date of clearing and re-vegetation/ rehabilitation activity • Size or areas cleared (in hectares) • Purpose for which clearing was undertaken • Description or re-vegetation and rehabilitating activities.
Operational Waste	Impacts to the terrestrial environment from planned discharges leading to behavioural / physiological impacts to fauna	Quadrant approved project specific Environmental Management Plan will contain waste management controls to reduce the risk of unplanned release of waste to the receiving environment. Bins will be placed in the laydown area and waste will be segregated steel, contaminated water, sludge, asbestos, contaminated soil, synthetic fibres, etc. This procedure includes standards for: • Bin types (steel bins for scrap metal, labelling to make clear what goes in each). • Lids and covers (where applicable bins have lids, and closed when not in use). • Waste segregation (separation of contaminated materials). Bin storage (where bins located, bins secured appropriately on vessels). Decontamination zone to manage oily boots etc. Closed waste skips (excepting steel waste) for vessel to vessel and AI to vessel transfers.

Event	Potential Impacts	Management Controls
		No waste (garbage) discharged to sea. Inductions cover: • Waste management (requirement to keep bin lids closed/ all waste skips covered during transfers (excepting steel bins)) • chemical management Sewage onshore AI contained within sealed facilities (ablutions) and removed to a licenced facility onshore for disposal. Educational awareness through workforce induction which includes information and management of sensitive fauna / flora, the activity boundaries (operational area and the lease area), and the vegetation clearing permit conditions. Sewage onshore AI contained within sealed facilities (ablutions) and removed to a licenced facility onshore for disposal.

Table 6-3: Environmental Impact Treatment Summary for Unplanned Events

Event	Potential Impacts	Management Controls
Marine		
Introduction of Invasive Marine Species	Unplanned introduction of marine species (IMS).	Anti-foulant systems are maintained in compliance with International Convention on the Control of Harmful Anti-fouling Systems on Ships. International vessels have AQIS clearance to be in Australian waters A biofouling vessel risk assessment (VRASS) is completed prior to mobilisation to Australia, or interstate as defined within the *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Commonwealth of Australia, 2008) and ranked as "low risk". Pursuant to the International Convention for the Control and Management of Ships' Ballast Water and Sediment 2004, vessels carrying ballast water and engaged in international voyages shall manage ballast water in accordance with a Ballast Water Management Plan so that marine pest species are not introduced.

Event	Potential Impacts	Management Controls
Injury or death to marine fauna	Vessels/equipment colliding with marine fauna.	Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Marine fauna identification posters and Marine Fauna Sighting Datasheets to be made available on board all vessels. Vessels maintain approach distances to marine fauna of, 150 m radius for dolphins and 300 m for whales as stipulated in Quadrant Interactions with Marine Fauna Procedure (EA-91-11-003). Support project vessels comply with Part 8 of EPBC Regulations for interacting with cetaceans to avoid collision with cetaceans as per Quadrant Interaction with Marine Fauna Procedure Bridge watch for marine fauna, including dugongs, during vessel movements by vessel crew. All personnel attend project induction which includes awareness of sensitive marine fauna. Project vessels will have a 5 knot speed limit within 500m of the island, where vessel activity will be focussed, and there is shallow bathymetry.
Disturbance to the seabed from vessel grounding	Disturbance to benthic habitats from vessel impact	Quadrant will provide bathymetry survey data and define the suitable approach channel for the landing craft (LCTs and personnel transfer vessels) within operational area that avoid shallow areas/ seabed hazards. Initial transit of LCTs approach to the beach are during daylight hours Works planned for optimised weather window based on 10 year metocean data. Weather forecast used to determine appropriate environmental conditions for vessel movements. Bridge watch will be maintained during pumping as required.
Accidental release of contaminated materials from removal of infrastructure	Accidental release contaminated materials from removal of infrastructure (liquid)	Quadrant approved Oily Water transfer methodology to include leak detection and shut down Bridge watch will be maintained during pumping as required. Quadrant approved contractor demolition methodology includes cleaning of steel prior to loading into skips. Closed waste skips (excepting steel waste) for vessel to vessel and AI to vessel transfers. Contaminated material contained on board for onshore disposal in accordance with Marine Order 41 – Carriage of Dangerous Goods. Sealed containers used for Island to vessel sludge waste transfers. Dry break coupling at vessel for hose (self sealing coupling). Oily waste water hose connections on pump and vessel is bunded. Hose specification fit for purpose. Flanged joints on hose Regular inspection of the oily water hose during pumping from Airlie Island. Continually manned operation.

Event	Potential Impacts	Management Controls
		Communication between Airlie Island and LCTs Flush hose at completion of oily water transfer (flush to vessel) Weather limits for the oily water transfer (as determined by the LCT vessel masters). Spill clean-up equipment located in proximity to hose connections to vessel and pump. In the event of a spill to sea, the Quadrant OSCP requirements implemented to mitigate environmental impacts. Vessels have and implement oil spill response Oil spill exercises conducted as per the OSCP (refer Section 10). JHA for activity highlighting key risks, and controls required to be in place. Toolbox meetings during oily water/ sludge transfer activities discuss the specifics of the activity. Education awareness on waste and spill management through vessel induction.
Spillage of environmentally hazardous liquid or solid waste to the marine environment	Non-hydrocarbon liquid release (surface)	Only non-hazardous, biodegradable detergents used for deck washing as per MARPOL. SDS available for all chemicals to aid in the process of hazard identification and chemical management. Chemicals managed in accordance with SDS in relation to safe handling and storage, spill-response and emergency procedures, and disposal considerations. Chemicals stored in secondary containment (e.g. double skinned container, on a portable bund or in bunded area). Chemicals on vessels stored in sign posted, designated chemical storage areas eg paint lockers. Scupper plugs or equivalent deck drainage control measures available where chemicals are stored and frequently handled. Quadrant approved project specific Environmental Management Plan (EMP) will contain Waste management procedure' controls to reduce the risk of unplanned release of waste to the receiving environment. The procedure This includes but is not limited to standards for: • Bin types (appropriate for waste type). • Lids and covers to reduce "littering" and further contamination. • Waste segregation for appropriate onshore disposal. • Bin storage in specific locations, and bunded where required eg bins containing hydrocarbon contaminated waste. No waste (garbage) discharged to sea. Closed waste skips (excepting steel waste) for vessel to vessel and AI to vessel transfers. Quadrant approved demolition methodology includes cleaning of steel prior to loading into skips.

Event	Potential Impacts	Management Controls
		Induction covers waste management (requirement to keep bin lids closed/ all waste skips covered during transfers (excepting steel bins), and chemical management). Material handling and lifting equipment maintained in accordance the PMS. Lifting equipment certified. Lifting JSA (vessel to vessel) to include communications during lifts to prevent loss of objects overboard. Contractor lifting procedures compliant with Quadrant Lifting Equipment Management System (LEMS) demonstrated by mitigation measures being included in JSA. Closed waste skips (except steel waste skips) during vessel to vessel and AI to vessel transfers Vessel dropped objects overboard are recovered (if possible) to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequences are negligible or safety risks are disproportionate to the environmental consequences. Chemical storage areas inspected weekly. All machinery and equipment involved in the discharge and transfer of liquids have maintenance scheduled on their respective planned maintenance system. Contaminated material contained onboard for onshore disposal in accordance with Environmental Protection (controlled waste) Regulations (2004). All shipboard chemical spills managed in accordance with vessels SOPEP/ SMPEP or oil spill response procedures. Spill clean-up equipment located in the vicinity of where chemicals are stored and frequently handled..
Accidental marine hydrocarbon releases could occur from: • Vessel collision/grounding; • Vessel refuelling; and • Minor hydraulic/lube oil spills from vessels	Accidental Marine Hydrocarbon Release	Use of double skinned diesel transfer tanks. Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Works planed for optimised weather window based on 10 year Metocean data. Weather forecast used to determine appropriate environmental conditions for vessel refuelling. Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation, which may trigger AHO to issue 'Notice to Mariners'. AMSA Rescue Coordination Centre (RCC) notified of operational area, activity and duration prior to mobilisation, which may trigger RCC to issue an AusCoast Warning. Tank designed for fork lift transport. Vessels will be fitted with collision avoidance radar (in accordance with class requirements) to enable communications between support vessels and commercial/3rd party vessels. All vessels undergo an International Marine Contractors Association (IMCA), Common Marine Inspection Audit (CMID)

Event	Potential Impacts	Management Controls
		inspections to confirm that they meet industry HSE and maintenance standards. Vessels have and implement an oil spill response procedure. Vessel refuelling procedures includes: • refuelling conducted in daylight hours • certified fuel transfer hoses with trigger nozzle • inspection of dry break couplings • fully manned and continuously monitored operations. Notifications to DoT of proposed mooring installations and anchoring locations. Quadrant will review mooring analysis to confirm mooring is fit for purpose. Quadrant will provide bathymetry survey data and define the suitable approach channel for the LCTs within operational area that avoid shallow areas/ seabed hazards. There is no spillage of hydrocarbons to the marine environment. Oil spill exercises conducted as per the OSCP.
Terrestrial		
Introduction of non-indigenous flora and fauna species	Introduction of non-indigenous flora and fauna species	Quarantine management for the projects is in accordance with Quadrant procedure to ensure that any invertebrates and vertebrates, cobwebs, seeds, plant material, soil, oil and grease and no prohibited packaging is transferred to AI and includes: • Requirement for all personnel travelling to site to complete a self declaration form; • Completion of a quarantine inspection checklist on all equipment. Vermin baits on vessels in accordance with Quadrant Quarantine procedure Weed inspection and removal/ spraying targeting all work areas prior to commencement of activity. Opportunistic weeding during activity Weed inspection and removal/ spraying targeting all work areas following completion of activity. All weeds that are removed to be placed in existing, designated “weed” bin used for annual monitoring events. No work areas outside of vegetation clearing permit boundary to limit vegetation disturbance and prevent weed spread Educational awareness through workforce induction which includes information and management of sensitive fauna / flora, the activity boundaries (operational area and the lease area), and the vegetation clearing permit conditions. Education awareness of key weed species through placement of “weed identifying” posters on noticeboards, site personnel to report sightings of potential weeds to HSE Advisor

Event	Potential Impacts	Management Controls
Accidental Fire	Destruction of vegetation and habitat and injury or death to fauna	Educational awareness for all personnel in the use and location of firefighting equipment. All vehicles and equipment shall remain on marked tracks and within designated works areas. Portable fire extinguishers located with machinery/ equipment. Ignition sources are controlled to minimise potential for fire and explosion hazards. No smoking within Operational area on Airlie Island. During tank cleaning process the following control are implemented: • Permit to work • Force ventilation of tanks • Fire watch • Fire foam blanket available in the event of a fire Emergency Response Plan includes for management in event of fire.
Disturbance to fauna due to physical terrestrial presence.	Disturbance to fauna due to physical terrestrial presence.	Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Removal of osprey nest from the top of the tanks (Regulation 15 of Wildlife Conservation Act) to discourage them from roosting on infrastructure, and encourage alternative nesting areas elsewhere on island. Use of deterrents installed at least 4 weeks prior to commencement of activity to discourage nesting in laydown areas. Spotters ahead of any machinery movement where habitat will be disturbed for the first time to identify environment sensitivities. Signs of nesting fauna shall be checked for daily within the project area and project boundary. Should signs of nesting fauna, be found, additional controls shall be implemented if possible, such as ensuring personnel are alerted of sensitive location. Demarcate sensitive locations with barricades (e.g ropes). All open pipes sealed on completion of activity. Trapped fauna removed if identified. Garbage bins to be covered. Removal of trapped or injured fauna as required (Regulation 15 of Wildlife Conservation Act) to relocate to alternative location elsewhere on island. No work areas outside of vegetation clearing permit boundary to limit vegetation disturbance and prevent weed spread. Educational awareness through workforce induction which includes information and management of sensitive fauna, the activity boundaries (operational area and the lease area), and the vegetation clearing permit conditions.

Event	Potential Impacts	Management Controls
Non-hydrocarbon release of solids and liquids	Non-routine discharge of non-hydrocarbon solids	Quadrant approved project specific Environmental Management Plan will contain waste management controls implemented to reduce the risk of unplanned release of waste to the receiving environment. This will include standards for: • Bin types. • Lids and covers. • Waste segregation. • Bin storage. No waste (garbage) discharged to sea. Inductions cover: • Waste management (requirement to keep bin lids closed/ all waste skips covered during transfers (excepting steel bins)) • chemical management SDS available for all chemicals to aid in the process of hazard identification and chemical management. Chemicals stored in sign posted, designated chemical storage areas. Chemicals stored in secondary containment (e.g. double skinned container, on a portable bund or in bunded area) Chemicals to be used on Airlie Island approved through Quadrant's chemical management system. Material handling and lifting equipment and remediation equipment maintained in accordance the PMS. Lifting equipment certified. Contractor lifting procedures compliant with Quadrant Lifting Equipment Management System (LEMS) demonstrated by mitigation measures being included in JSA. Material handling and lifting equipment and remediation equipment maintained in accordance the PMS. High level alarm on sewage/toilet tanks. Closed waste skips (excepting steel waste) for AI to vessel transfers. Dropped objects are recovered (if possible) to mitigate the environmental consequences from objects remaining in the terrestrial environment, unless the environmental consequences are negligible or safety risks are disproportionate to the environmental consequences.
Accidental release contaminated materials from removal of infrastructure (liquid)	Toxic impacts and damage to terrestrial vegetation and fauna; Soil and groundwater	Quadrant approved oil water transfer methodology to include leak detection and shutdown. Dry Break couplings (self-sealing) to be used for hose at pump connections (self-sealing coupling where hose is planned to be disconnected frequently).

Event	Potential Impacts	Management Controls
	contamination.	Hose specification fit for purpose. Regular inspection of the oily water hose and connections (inclusive of drip trays under connections) during pumping. Continually manned operation. Leak testing of hose prior to commencing pumping activity. Communication between Airlie Island and LCTs. Spill clean-up equipment located in proximity to hose connections to vessel and pump. Removed steel is cleaned prior to entering skip bins. Washing inside tank contained within tank. Secondary containment / bunding in place around ISO tanks during cleaning. ISO tanks located away from traffic routes. Wash-water is filtered and re-used. Wash-water stored in ISO tanks. Wash-water disposed of on mainland. Sealed containers used for sludge waste transfer. Oily water managed by a licenced waste contractor. Education awareness on waste and spill management through HSE induction.
Accidental terrestrial hydrocarbon release	Hydrocarbon Release (terrestrial)	Quadrant approved refuelling procedures Certified hoses used. Secondary containment or bunding at designated refuelling location. Refuelling at designated locations (where possible). Where equipment requires refuelling outside of designated location then secondary containment, and use of certified fuel hoses with trigger nozzle. All refuelling operations are manned and visually monitored. Spill clean-up materials in the vicinity of all refuelling operations. Diesel tank is only moved via low level lift. Certified hoses used for refuelling. Inspection of machinery prior mobilisation. Daily pre-start inspections.

Event	Potential Impacts	Management Controls
		Equipment maintained in accordance with PMS. Use of double skinned tank. Spotters during transport of diesel tank on Airlie Island. Tank designed for fork lift transport. Activity scheduled to occur from June to August, outside of turtle and shearwater peak nesting periods. Spill kits and trays available.

7. MANAGEMENT APPROACH

The Airlie Island Remediation activity will be managed in compliance with all measures and controls detailed within the EP accepted by DMP under Petroleum (Environment) Regulations 2012.

The objective of the EP is to ensure that potential adverse environmental impacts associated with unplanned events and planned events associated with the survey, are identified and assessed, and to stipulate mitigation measures to avoid and/or reduce any adverse impacts to the environment to ALARP.

The EP details specific performance objectives, standards and procedures, and identifies the range of controls to be implemented (consistent with the standards) to achieve the performance objectives. The controls for the activities are summarised in **Section 6**. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

As described in the EP, the implementation strategy includes the relevant details of the following:

1. Environmental management policy
2. Environmental performance standards and outcomes
3. Environmental Management System including ownership and objectives, audits, monitoring and review
4. Leadership and responsibilities
5. Workforce training and competency
6. Performance review and continuous improvement
7. Records
8. Management and review of the EP
9. Routine and incident reporting

During the period that activities described in this EP are undertaken, Quadrant will ensure environmental performance is managed through an inspection and monitoring regime undertaken by Quadrant Energy representatives or delegates based on Airlie Island.

Environmental compliance of an activity with the EP (and the EPO's) is measured using planned and systematic audits or inspections to identify weaknesses and non-conformances in the system and processes so that they can be identified. Improvement opportunities identified through monitoring, audits and incident investigations are implemented in a controlled manner and communicated to all relevant workforce, contractors and relevant third parties. Audits and inspections are in place to identify possible incidents and actions taken to prevent them from happening.

Non-conformances found are addressed and resolved by a systematic corrective action process and are reported to DMP where relevant.

Senior Quadrant Energy and contractor personnel will be accountable for ensuring conformance with environmental performance outcomes and standards and all personnel will be empowered to 'stop-the-job' to ensure the activity is being implemented in an environmentally responsible manner. The EP identifies specific responsibilities for each role during the activity.

Incident notification and reporting to DMP and other regulators will be conducted as per the Petroleum (Environment) Regulations 2012, as detailed within the EP. Reported HSE incidents and hazards will be communicated to personnel during daily operational meetings.

8. HYDROCARBON SPILL RESPONSE ARRANGEMENTS

The risk assessment for the Activity has identified a number of credible spill scenarios as provided in **Table 8-1**.

Table 8-1: Credible spill scenarios for the Activity

Spill scenario	Spill volume	Spill location	Response Level
Vessel grounding or collision	<329 m^3 diesel	Marine	1/2
Vessel refuelling spill	2.5 m^3 diesel		1
Vessel lube and hydraulic oil spills	<1 m^3		1
Oily water transfer spill	Up to 25 m^3 oily water (containing an estimated 132 L oil)	Marine or Terrestrial	1
Vehicle/ equipment refuelling spills	Up to 0.5 m^3 diesel	Terrestrial	1
Diesel tote tank damage (10,000 L capacity)	Up to 10 m^3 diesel		1
Hydraulic hose leaks	Up to 80 L hydraulic fluid		1

The VI Hub Oil Spill Contingency Plan (OSCP) (EA-60-RI-186) Revision 4 accepted by DMP on 25 September 2014) referred to as VI Hub Oil Spill Contingency Plan (OSCP) (EA-60-RI-186) is considered fit for purpose for the Activity and will be referred to in response to accidental hydrocarbon spills, providing guidance on notification and spill response requirements. The VI Hub OSCP was written to encompass all infrastructure and operational activities on and around Varanus Island and Airlie Island and is considered fit for purpose for responding to the spill scenarios identified for the activity in terms of the hydrocarbon type, volume and spill location.

With the exception of a worst case vessel collision/ grounding spill, the spill scenarios considered credible for the Activity are classified as Level 1 (Tier 1) spills, which are expected to be handled using the resources available onsite without activation of an offsite Incident Management Team or mobilisation of offsite equipment and personnel. For each identified spill scenario for the activity, the VI Hub OSCP has been reviewed and assessed for appropriateness.

Through the assessment of the expected hydrocarbon behaviour(s), modelling results of credible worst-case spill scenario, and identified environmental priorities within the predicted spill impact areas, a set of functional, achievable oil spill response strategies have been selected for a Level 2 MGO (diesel) release. If a spill occurred, the actual oil spill response strategies employed will be defined through the application of a Net Environmental Benefit Analysis (NEBA) which will ensure that the strategies which result in the greatest environmental benefit will be applied.

9. CONTACT DETAILS

Further information about the Airlie Island Remediation Works Activity can be obtained from:

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10. REFERENCES

Chevron (2005). Gorgon Development on Barrow Island Technical Report Intertidal Habitats. Technical Appendix C9 prepared by RPS Bowman Bishaw Gorham April 2005 for Chevron Texaco Australia, Perth, Western Australia.

DEC (2007). Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007-2011. Management plan No. 55. Department of Environment and Conservation. July 2007.

Department of Agriculture and Food 2014 : https://www.agric.wa.gov.au/

Halfmoon Biosciences, (2015) Airlie Island Contaminated Sites Remediation Project, Seabird breeding and activity on Airlie Island

Pendoley KL (2005) Sea Turtles and the Environmental Management of Industrial Activities in North West Western Australia, PhD Thesis, Murdoch University, Australia. 310pp.

Surman, C.A. and Nicholson, L.W. (2011). Monitoring the distribution and abundance of the EPBC listed skink Ctenotus angusticeps on Airlie Island, October 2009. Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences, Denmark. 17ppSVT. (2010). Underwater Noise Assessment Halyard-1. Unpublished report prepared for Apache Energy Ltd by SVT Engineering Consultants.

WA Government Gazette (2012b). Wildlife Conservation (Rare Flora) Notice 2012(2) Government of Western Australia. 6 November 2012.

Weeds of National Significance (Australian Weeds Committee 2012) : http://www.weeds.org.au/WoNS/