BassGas Offshore Environment Plan Summary - Operations

OEUP-T5100-PLN-ENV-008

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1. Introduction

Origin Energy Resources Ltd (Origin Energy) is the majority owner and operator of the BassGas Project. The BassGas project includes the Yolla A offshore platform, located in Bass Strait 147 kilometres south of Kilcunda, a gas pipeline and an onshore gas plant near Lang Lang in Victoria.

Commercial production of gas commenced in June 2006 and is currently produced from the Yolla platform via two production wells, Yolla-3 and Yolla-4. The offshore facilities have been designed to incorporate additional production wells from the Yolla field and also to tie-in other gas discoveries in the region.

An Environment Plan (EP) is in place for the BassGas Offshore Facilities [OEUP-T5100-PLN-ENV-005]. The EP was accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 29th August 2012. This EP Summary document summarises the content of the BassGas Offshore Facilities EP in accordance with Regulation 11(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Origin Energy is committed to all aspects of environmental protection and biodiversity conservation as it relates to its business. This commitment is expressed in the company's Health, Safety and Environment (HSE) Policy and Standards, which form the foundation of its management practices, and the performance that must be attained by all operations and associated contractors. A vital part of the implementation of the HSE Policy and Standards is the Origin Energy HSE Management System (HSEMS).

The ongoing compliance monitoring, auditing and reporting against legislative and Origin Energy operational criteria is an integral part of the operation of the BassGas project and Origin Energy's commitment to ensure that all adverse effects on the environment resulting from Origin Energy activities (associates and sub-contractors) are identified, assessed and as far as reasonably practicable, eliminated or minimised.

2. BassGas Offshore Facilities Activity Description

2.1 Location

The Yolla field lies in Production Licence T/L1, located in the Bass Basin. The T/L1 Production Licence comprises four whole acreage blocks (blocks 3262, 3334, 3335 and 3467). Figure 2-1 shows the location in relation to the Victorian and Tasmanian coastlines. The location of the Yolla A platform is Latitude 39º 50' 40.5", Longitude 145º 49' 06.3" or 5,588,824 North, 398,910 East (GDA94, Zone 55).

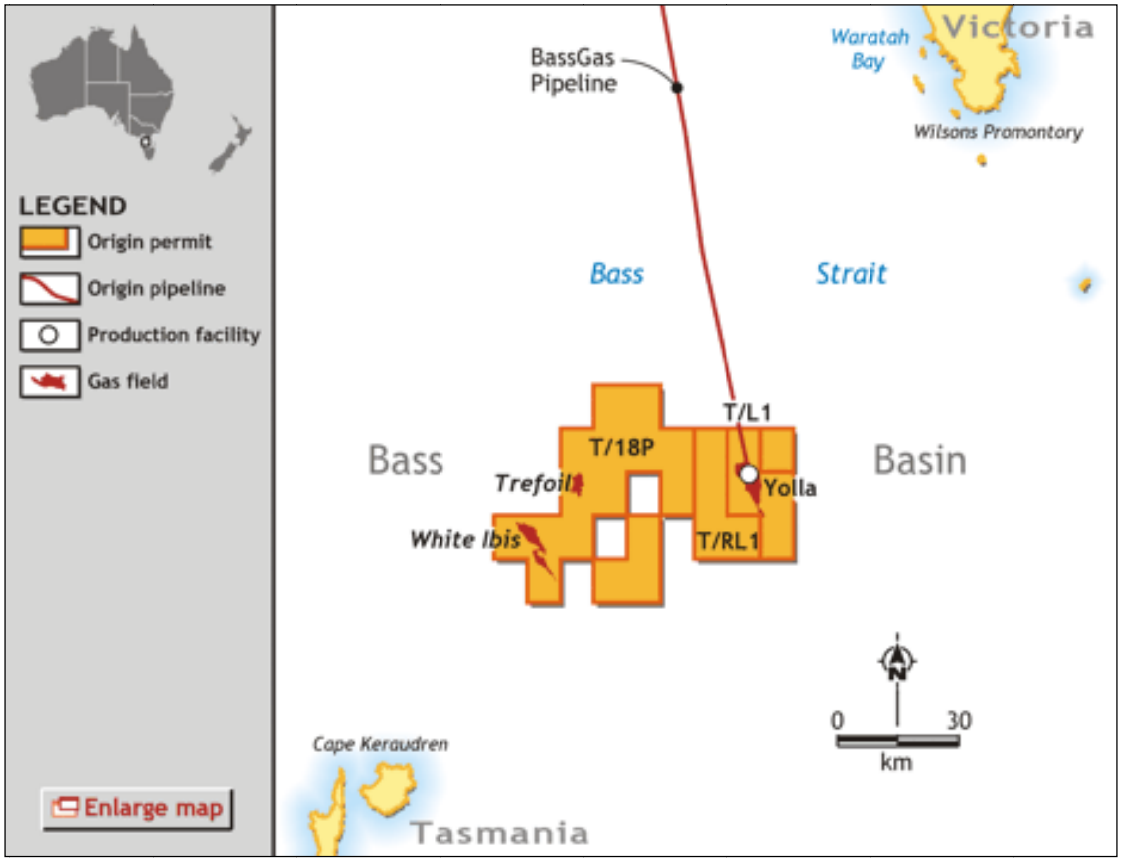

Figure 2-1 Location of Yolla Gas Field, T/L1 Production Licence, Bass Basin

The BassGas Offshore Pipeline route (see Figure 2-2) runs from the Yolla A platform in central Bass Strait to the Lang Lang gas plant in Victoria and has a total length of 180 km. The pipeline horizontal directional drill (HDD) shore crossing entry point is approximately 1 km east of the town of Kilcunda at 368,270 East and 573,1120 North. The offshore section of the pipeline is 147.5 km in length.

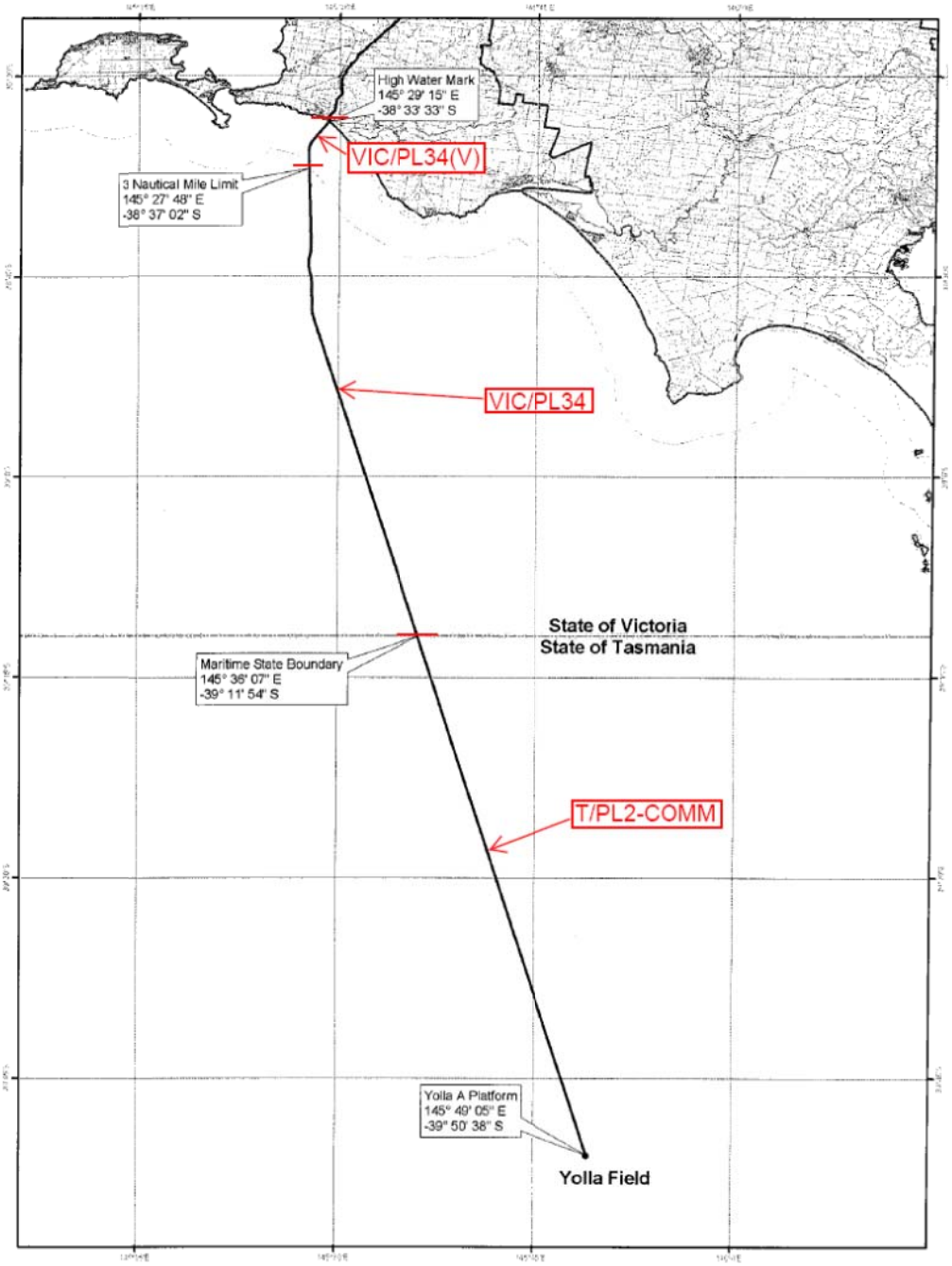

Figure 2-2 BassGas Offshore Pipeline Route

2.2 Operational Details

The BassGas project commenced production in June 2006. Prior to the December 2011 shutdown for the Yolla Mid Life Extension (MLE) Project construction the platform was producing approximately 52 Terajoules (TJ) per day of sales gas, 200 tonnes per day of LPG and 445 kilolitres (kL) per day of condensate. The platform exports dehydrated gas and condensate via a two-phase pipeline to the onshore receiving facilities via a 147 km long 250 mm nominal bore (NB) raw gas pipeline from the platform to shore. The pipeline continues onshore for another 34 km before entering the Lang Lang gas plant.

Completion of the MLE project will not increase production from nameplate (67 TJ's per day) per se from the field but through the installation of an accommodation module (Figure 2-3) will allow for full time maintenance and therefore less production down-time. It will also extend production from existing wells by introducing compression and pumping facilities. Future drilling campaigns that tie-in new production wells to the facility also will not likely result in substantially increased production but simply replace levels from wells in decline.

The modes of operation following completion of the MLE project works are:

- Normal basic manned operation with typically 5 to 8 persons on board for basic operations and routine maintenance activities.
- Normal fully manned operation with up to 19 persons sleeping on platform and up to 22 persons on board (POB) for wireline and planned maintenance activities.
- Non-manned operation; and
- In exceptional circumstances, manned operation with up to 37 sleeping on platform on a 2 shift (24/7 operations) basis and a maximum POB of 44. This mode is for major campaigns, such as well workover and construction works.

Figure 2-3 The Yolla A platform with new quarter installed

2.3 System Overview

The Yolla A Platform is a self-installing *Drill-Ace* platform designed by Arup with a stiction type skirted jacket foundation design to account for the geotechnical conditions at the platform location.

After completion of the MLE project, the offshore platform facilities will comprise:

- Yolla A Platform in 80.5 m water depth
- accommodation facilities for up to 37, normally only 5-8 (new)
- 8 conductors (2 installed for existing production wells)

- two production wells, trees and chokes
- production manifold
- production facilities for separation and dehydration of gas and liquids
- compression facilities (new)
- condensate pumping (new)
- pigging facilities
- drains (some new tie-ins)
- produced water facilities and dump caisson
- flare system
- diesel storage (some new)
- chemical storage and injection, and
- power generation (one generator replaced).

The offshore platform (see Figure 2-4) shall be 'normally' manned and will be controlled via the satellite telemetry link from the onshore gas plant.

The Yolla A platform facility is self sufficient in terms of power generation, fuel gas conditioning and instrument air facilities. It also has a full safety shutdown system including a flare, closed and open drain systems and provision for reprocessing of liquids.

Chemical injection facilities are provided on the platform for times of upset conditions or abnormal operation where methanol may be required to mitigate against hydrate formation or used as a preventative measure during startup. Other chemicals including demulsifier, reverse demulsifier and corrosion inhibitor are also provided. At present, demulsifier and reverse demulsifier are not required for use, and as such this equipment has been mothballed.

Figure 2-4 Yolla Platform with accommodation module

2.4 Offshore Pipeline

The 350mmNB offshore pipeline exports dehydrated gas and condensate from the Yolla A platform to the onshore gas plant at Lang Lang.

The subsea pipeline connects to the foot of the riser at the Yolla A platform and runs approximately 147 km along the sea floor in a direct route to the landfall located south east of the township of Kilcunda on the Victorian coastline. The subsea pipeline section was installed by the conventional S-lay method. The shore crossing consists of a Horizontal Directionally Drilled (HDD) buried pipeline of approximately 1.4 km length and passes well under the surf zone, beach and coastal dunes. The HDD shore crossing entry point is at the Kilcunda landfall and is drilled out to the HDD exit point which meets up with the subsea pipeline section. From the shore crossing the Raw Gas Pipeline continues for 32.4 km as a buried onshore pipeline to the gas plant at Lang Lang.

The offshore pipeline is located on the seabed and stabilised by a concrete weight coat along its length. The riser, submerged pipeline and shore crossing are protected by protective coatings. Aluminium/ zinc bracelet type sacrificial anodes are installed along the full length of the pipeline on the sea bed and the riser to provide protection in case of coating damage. The shore crossing is protected by an impressed current cathodic protection system. No internal pipe coating is provided and internal corrosion is controlled by separation and dehydration of the well fluids and the continuous injection of corrosion inhibitor into the pipeline at the Yolla A platform.

The pipeline has a single Main Line Valve (MLV) station near the shore crossing at Kilcunda. The valve station is set back from Bass Highway and is a buried installation in a small unobtrusive compound located on private property. The 350NB MLV ball valve is locked open under normal operation with the valve hand-wheel stored at the gas plant.

The offshore pipeline and riser are able to be isolated from the platform topsides facilities by the Last Valve Off (LVO). The LVO is located above the water level on the riser just below Cellar Deck and is controlled by the platform Emergency Shutdown (ESD) system. It is a high integrity valve protected by a High Integrity Pressure Protection System (HIPPS). The pipeline approach to the platform, to the west from the south-western jacket leg, was selected to avoid the possibility of damage from drill-rig or crane operations. The riser is located within the Yolla A platform jacket substructure and this provides impact protection.

2.5 Logistics

Following completion of the MLE project, the Yolla A platform will be 'normally' manned with 5-8 personnel. The onshore gas plant control room will remotely control all normal operations during manned and un-manned periods.

Wireline/well intervention operations are expected to occur approximately once or twice per well per year and could require up to 16 personnel for approximately 10 days.

2.6 Helicopters

Helicopters are the primary form of transport for personnel to and from the platform and the preferred means of evacuation. Depending on the accident and evacuation scenario, evacuation by helicopter will not always be safe or practicable.

The helicopters used are generally Sikorsky S-76, Aerospatiale Super Puma or other approved aircraft. Origin policy stipulates that only twin-engine helicopters with two pilots be used to transport personnel offshore. Approximate flight time (one way) between the helicopter base at Tooradin (Victoria) and the Yolla Platform is 45 minutes. During normally manned periods there will be approximately three return helicopter flights per week to the platform.

A weather station on the platform measures wind direction, wind speed, barometric pressure and ambient temperature and transmits the data to the onshore gas plant control room. This allows the helicopter pilots to obtain pre-flight real-time weather information before departing base.

The platform has helicopter radio communication links and a non-directional beacon (NDB) for helicopter navigation purposes.

2.7 Supply and Support Vessels

To support Yolla A platform operations a supply vessel will visit the platform approximately once per month during normal manning and will deliver:

- food for manned operations
- diesel fuel
- production chemicals and
- maintenance equipment and materials.

The supply vessel will also be used to offload domestic and industrial waste generated on the Yolla A platform.

Additional offshore support vessels will be required to undertake Remotely Operated Vehicle (ROV) survey and checks of both the platform and pipeline, as a part of ongoing asset integrity monitoring program. In addition, an ROV survey for the future drilling campaign is required. This includes debris surveys and seabed sampling to collect geotechnical data from the existing spudcan holes close to the Yolla A platform.

3. Description of Receiving Environment

The BassGas Environment Effects Statement/Environmental Impact Statement (EES/EIS) document (Origin Energy, 2002), provides an extensive description of the marine environment and biodiversity within Bass Strait that is proximal to the Yolla A platform and associated pipeline infrastructure.

The Zone of Potential Impact (ZPI) for the BassGas offshore activities covers the area around the Yolla A platform itself, the pipeline route, the nearby islands (Kent Group, King Island) and the coastline stretching from Westernport Bay to Corner Inlet.

Further details on the environmental impacts identified are provided in the Yolla A Platform and Pipeline Oil Spill Contingency Plan (OSCP) [OEUP-T5100-PLN-PFM-004].

3.1 Physical Environment

Bass Strait is a sea strait separating Tasmania from the south of the Australian mainland. It is approximately 240 km wide at its narrowest point and contains many islands including King Island and Flinders Island.

Bass Strait lies on the southern margin of the Bass Basin in water depths between 50 and 80 m, and is an oceanic region approximately 50 km off the Tasmanian coast. The southern margin of the Bass Basin is an area of continental shelf. A shallow basement in the south gives way to thick (>7 km) predominantly clastic sediments in the basin to the north. There is little sediment currently being supplied to region.

3.1.1 Climate

Bass Strait is located on the northernmost zone of what is called the 'Roaring Forties' and its climate is determined chiefly by the presence of subtropical high pressure ridges and the migratory low pressure systems (extratropical cyclones). Migrating low pressure systems typically bring a westerly wind regime to Bass Strait and are likely to affect the area every three to five days on average during the winter months.

The wind directions in central Bass Strait have a slightly higher probability of blowing from the southwest (southwesterly winds) during March to April, and a slightly higher probability of blowing from the northwest (northwesterly winds) during May to July. Winds will have typical mean speeds of 8 – 10.3 m/s, increasing to 12 – 15 m/s during storm onset and reaching typical maximums of 14.5 – 21.3 m/s, with even stronger gusts. Air temperatures in central Bass Strait are on average 13 - 21°C during summer and 9 - 14°C during winter. The average rainfall ranges from about 600 - 800 mm a year.

3.1.2 Tides and Currents

The tides of central Bass Strait are semi-diurnal with the dominant large-scale water movements due to the astronomical tide. The tidal waves enter Bass Strait from the east and west almost simultaneously and as a result, in the centre of the strait there is an area with small tidal currents where the two waves meet. The magnitude of the tidal currents then increase as the distance from the central strait increases with relatively strong tidal currents at either end. The times and magnitudes of the tide within Bass Strait are relatively uniform and predictable. However, the effects of meteorological phenomena may be significant, causing variations in level and also changing the phasing or timing of the tide.

The tidal range at the platform is estimated to be 2.3 m during spring tides and 1.7 m at neap tide. The lowest and highest astronomical tides at the platform are -1.47 m and +1.33 m respectively. Tidal currents at the platform move in an ellipse and tend to flood and ebb to the southeast and northwest respectively.

Local wind stress and regional drift tend to dominate the mean currents in the region and typically flow towards the east-northeast. Typical near surface current speeds are 0.1-0.26 m/s which generally decrease with increasing depth. At spring tides the maximum current speeds averaged over the water depth are about 0.21 m/s and the 100-year average recurrence interval (ARI) maximum current speed is estimated at about 0.41 m/s.

3.1.3 Waves

In Bass Strait interaction between sea and swell and the resultant wave motion is complicated by the islands and gaps between the Australian mainland. This restricts the access of swell from the Southern Ocean into Bass Strait. Some swell is blocked completely and some refracted by the seabed and modified as it passes into shallower waters of Bass Strait. There are also waves generated by wind within Bass Strait and the conditions at any location will be the result of these two wave-energy bands.

The local wave climate is derived principally from locally generated wind waves mostly from the west and southwest. Wave heights range from 1.5 m - 2 m with periods of 8 - 13 s, although heights of 5 - 7m can occur during storm events.

3.1.4 Water Temperature

Prevailing winds tend to maintain a well mixed water column to 80 m deep particularly during autumn through spring. Near-surface water temperatures during these times generally range from about 15-18°C with a similar spread of water temperatures throughout the water column. During warmer months some thermal stratification can occur, particularly in calmer periods. Annually, water temperatures range from a minimum of about 10.5°C near the seabed in winter to a maximum of more than 21°C at the surface in summer.

3.1.5 Seabed and Sedimentation

The bathymetric map for the area indicates that the seafloor is gently sloping with water depths increasing gradually to reach a maximum of about 80 m at the platform. Sedimentation in Bass Strait is generally low due to the small supply from rivers and the relatively low productivity of carbonate.

Seabed surveys have been conducted at the Yolla A Platform (the platform) location and along the pipeline route. Bathymetric maps indicate that the seafloor is gently sloping, dropping gradually to water depths of about 80 metres at the platform location. Survey data collected by Thales GeoSolutions (2001) indicates that the seabed is comprised of sandy, silty and clayey sediments, with rocky outcrops in one or two locations.

Benthic sampling in Bass Strait has consistently shown a highly diverse array of invertebrate fauna, with several polychaete families, pycnogonids, pericarid crustaceans, opisthobranch molluscs, bryozoans and brachiopods being the most prolific species. There were no significant seabed features identified, such as active shelves, or edge reef systems within the direct vicinity of the platform, or along the pipeline route.

3.2 Biological Environment

Species that are listed under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999 may migrate or move through the ZPI, including the blue whale, southern right whale, fin whale, humpback whale, grey nurse shark (eastern), great white shark and southern elephant seal. However, none of the species listed are dependent upon the area for food or reproduction.

The operation of the platform is considered unlikely to have any significant impact on the movements of migratory species. A noise assessment was undertaken in 2004, with the intention of monitoring noise during construction and operational activities (Curtin University, 2005). Noise was only monitored during construction due to delays in commissioning. Several whale species were evident in the recordings, where true and pygmy blue whales were recorded and at least one whale was in close vicinity to the receiver (based on high signal levels received) on one occasion (Curtin University, 2005). The identified movement of vessels to and from the project area was identified as the main potential impact on migrating whales. The movement of vessels was a minor risk and was considered unlikely to have any ongoing significant impact on whale migrating behaviour.

Great white sharks are uncommon and are not known to specifically breed, or be resident in the area, but are generally known to frequent waters around seal colonies. Grey nurse sharks have been reported from around most of the southern half of the continent, but are uncommon in Tasmanian waters.

Four species of turtles (loggerhead, green, hawksbill and leatherback), which are listed as endangered or vulnerable under the Environment Protection and Biodiversity Conservation (EPBC) Act, have been observed in Bass Strait. These are primarily at risk from entanglement in fishing nets, incidental by-catch and ingesting marine debris. The waste management program (including adherence to the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/78) on the platform will avoid increasing marine debris.

Migratory seabirds protected by international agreements such as the Bonn Convention, Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) may pass through or near to the well location on route to islands in Bass Strait and/or Tasmania. Foraging groups of seabirds were also sporadically sighted in the area. There are however, no seabird breeding colonies located in the permit area.

Disturbance to the Commonwealth marine area is limited to a potential hydrocarbon spill and the disposal of produced formation water for the platform location. In the event of an oil spill, the BassGas Oil Spill Contingency Plan (OSCP) [OEUP-T5100-PLN-PFM-004] will be implemented.

3.3 Coastline and Marine Protected Areas

In the immediate vicinity of the BassGas offshore facilities there are no marine reserves, World Heritage sites, areas listed or nominated on the Register of the National Estate or listed Ramsar wetlands.

Bass Strait does however support a number of marine protected areas. These marine protected areas are declared under several pieces of legislation, including the:

- Victorian *National Parks (Marine National Parks and Marine Sanctuaries) Act 2002*, which establishes 13 highly protected marine national parks and 11 smaller marine sanctuaries in Victorian waters;
- Tasmanian *Nature Conservation Act 2002,* which establishes 7 marine nature reserves in Tasmanian waters*;* and
- *Commonwealth EPBC Act*, which establishes 13 marine protected areas around Australia.

The closest marine protected areas to the BassGas offshore facilities are:

- Wilsons Promontory Marine National Park is approximately 70 km to the east of the pipeline;
- Bunurong Marine National Park approximately 20 km to the east of the pipeline; and
- Kent Group Marine Nature Reserve 90 km to the east of the pipeline and offshore platform.

Of these, the Bunurong and the Kent Group are considered to be in the ZPI.

4. Environmental Impact Assessment

To satisfy the requirements of the EPBC Act, the Origin Energy EES/EIS for the BassGas project identified the potential environmental effects and risks from platform construction and operational activities. In summary, the EES/EIS indicated there would be minor, localised effects to the biota at and near the platform and pipeline locations during installation and operation.

A systematic process of hazard identification and risk assessment was completed in order to review the impacts and risk to the environment from the BassGas Offshore Facilities. Through the implementation of specific control measures to prevent or mitigate the environment impacts, risks to the existing environment from the BassGas offshore facilities are As Low As Reasonably Practicable (ALARP). The environment impacts identified from these risk assessments are summarised in Table 4-1.

Table 4-1 Environmental Risk Assessment Summary

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
Routine Impacts										
Primary Wastes	R1	Disposal of Produced Water	• Discharge of hydrocarbons, mercury and BTEX into the marine environment	2 / Moderate	6 / Almost Certain	High	▪ Platform / process design; Produced water disposal / dump caisson system design. ▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) ▪ Oil in Water Analyser and technical monitoring from engineering function. ▪ Training and competency of personnel (CCPS-13) Additional controls considered but rejected: ▪ Reinjection of produced water into the Yolla reservoir was considered during initial design and discounted based on cost (drilling of an additional well and provision of water reinjection system). ▪ Storage and removal to shore of produced water was not deemed to be practicable due to the high volumes of produced water from the wells. ▪ Retrospective implementation of such a system is not viable due to weight constraints on the platform following recent modifications to install compression and accommodation modules on the Yolla A platform.	2 / Moderate	3 / Unlikely	Medium (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	R2	Flaring	• Decline in air quality / air pollution, contributions to global warming	1 / Minor	3 / Unlikely	Low	▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) ▪ Flare Auto-ignition system and flame out monitoring ▪ Back up flare ignition/pilot system (propane) ▪ Back up purge protection system (nitrogen) ▪ Flare rate monitored, recorded and reported ▪ Training and competency of personnel (CCPS-13) ▪ Start-Up Procedures (CCPS-08)	1 / Minor	1 / Remote	Low (ALARP)
Minor Wastes	R3	Sewage and domestic food wastes	• Localised increase in nutrient loading	1 / Minor	2 / Highly Unlikely	Low	▪ Food waste macerated prior to disposal to sea ▪ Sewage macerated via vacuum system prior to disposal to sea ▪ Biodegradable chemicals used ▪ High energy marine environment with significant current flow, water depth (Natural dispersion achieved) ▪ There are no sensitive marine ecosystems in the vicinity of the platform Additional controls considered but rejected: ▪ Remove all sewage and macerated waste to shore. Rejected as this would require additional vessel visits and temporary storage on the facility which introduces hygiene issues. This is not supported by site personnel. It is not in accordance with standard practice and introduces additional environmental and health risks.	1 / Minor	1 / Remote	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	R4	Emissions from combustion engines	• Decline in air quality / air pollution, contributions to global warming	1 / Minor	6 / Almost Certain	High	▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) ▪ Main Power Generators and turbine design (run off fuel gas – rather than diesel) ▪ Location of exhausts in well ventilated areas and Exhaust study confirmed acceptability of helideck and HVAC inlets ▪ Equipment selection (fuel gas rather than diesel operated)	1 / Minor	2 / Highly Unlikely	Low (ALARP)
	R5	Deck drainage	• Discharge of chemicals / oil into the marine environment and impact on marine species.	1 / Minor	6 / Almost Certain	Medium	▪ Platform design – including enclosed drainage systems for operational areas, bunded storage areas for used oil and other liquid hazardous waste (CCPS-10.2). ▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) spill kits installed at all machinery points on the main deck ▪ Training and competency of personnel (CCPS-13) including use of drain covers and bungs in use during operations with an higher risk of spill i.e. waste oil transfer Additional controls considered but rejected: ▪ Storage and removal to shore of deck runoff (including hydrocarbon spills, diesel / chemical spills) was not deemed to be practicable due to the high volumes of rain water that would be collected. ▪ Retrospective implementation of such a system is not viable due to weight constraints on the platform following recent modifications to install compression and accommodation modules on the Yolla A platform.	1 / Minor	2 / Remote	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
Physical Impacts	R6	Noise from platform, supply vessels or helicopter operations	• Behavioural change in marine fauna (localised avoidance/attraction) • Hearing impartment and pathological damage to marine fauna • Increase stress levels in marine fauna • Disruption to marine fauna underwater acoustic cues • Secondary ecological effects – alteration of predator prey relationship	1 / Minor	3 / Unlikely	Low	▪ Noise levels on the platform have been assessed and minimised as far as practical for OH&S reasons ▪ Compliance with the *Australian National Guidelines for Whale and Dolphin Watching* (DEH 2005)Vessels and Helicopter ▪ Helicopter flight paths and elevation minimises noise levels at sea surface. ▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) ▪ Training and competency of personnel (CCPS-13) abnormal / higher noise levels will be picked up and acted upon ▪ No evidence that platform, supply vessels or helicopter noise unduly impacts the resident seal population. Additional controls considered but rejected: ▪ Use of solar energy for power generation. Rejected due to inadequate available space on the platform for the number of solar cells required to generate sufficient power.	1 / Minor	3 / Unlikely	Low (ALARP)
	R7	Light emissions from platform or supply vessels	• Disturbance of migration of seabirds and other marine life that may be attracted to lighting from the rig and support vessels.	1 / Minor	3 / Unlikely	Low	▪ The platform is not on major migration path between Tasmania and the main land and there has been no known environmental impact to date ▪ Lighting facing outwards only turned on as required i.e. emergency lighting / spot lights at life raft locations ▪ Lighting levels required to maintain platform safety and to comply with navigational requirements.	1 / Minor	3 / Unlikely	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	R8	Physical presence of platform	• Reduction in available fishing area • Collision with the platform by shipping or fishing vessel – note not a routine event	1 / Minor	6 / Almost Certain	Medium	▪ Platform, pipeline and 500 m safety zone marked on navigation charts ▪ Navigation aids on platform ▪ Fisheries consultation shows minimal direct impact on fishermen or access to grounds ▪ Communication to relevant fishing operators in the location ▪ Engagement of a Fisheries Liaisons Officer with practical and academic fisheries experience in the region to consult with fishermen and provide them with co-ordinates of facilities ▪ Fisheries Management Plan with formal grievance procedure for genuine/validated losses incurred	1 / Minor	2 / Highly Unlikely	Low (ALARP)
Non Routine Impacts										
	N1	Loss of containment of lubricating oil or grease Loss of containment of ROV hydraulic fluid	• Discharge of oil into the marine environment and impact on marine species. • Disturbance of marine environment from ROV and diving activities discussed and assessed to be minor.	1 / Minor	4 / Possible	Medium	▪ Platform / process design (CCPS-10.2), Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) – solid / plated deck, liquid inventories bunded. ▪ Spill kits installed at all machinery points on the main deck ▪ Training and competency of personnel (CCPS-13) including use of drain covers and bungs in use during operations with an higher risk of spill i.e. waste oil transfer ▪ Lifting management /controls while transferring to and from the supply vessel ▪ Contractor Management system – management of – hoses, preventative maintenance, pre-dive / ROV checks	1 / Minor	1 / Remote	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	N2	Loss of containment of Chemicals	• Discharge of chemicals into the marine environment and impact on marine species.	1 / Minor	4 / Possible	Medium	▪ Chemicals are subject to detailed hazardous materials risk assessment. ▪ Platform / process design; permanently stored chemicals are stored in self contained, bunded skids. ▪ Asset integrity program (CCPS-10.1) and maintenance management systems (ORACLE) – solid / plated deck, tanks and vessels, liquid inventories bunded, use of temporary bunds. ▪ Yolla has a limited inventory of chemicals ▪ Training and competency of personnel (CCPS-13) - Use of competent workover contractors (contractor management process) ▪ Operating and maintenance procedures (CCPS-09) ▪ Det Norske Veritas DNV rated containers (CCPS-09) Additional controls considered but rejected: ▪ Provide portable bunds for safe storage of chemical drums. This was rejected due to available space on platform and hold-up volumes. It also does not reduce the risk for miscible chemicals.	1 / Minor	2 / Highly Unlikely	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	N3	Accidental disposal of waste	• Discharge of waste materials into the marine environment and impact on marine species.	3 / Serious	6 / Almost Certain	Severe	▪ Training and competency of personnel (CCPS-13) - Use of and compliance with Waste Management Procedures and processes. ▪ Equipment design, Asset integrity program (CCPS-10.5) and maintenance management systems (ORACLE) – particularly as it relates to the crane and lifting equipment. Additional controls considered but rejected: ▪ Elimination of mercury and lead not possible. Mercury is present in the reservoir fluid. Risk of removal of the existing lead-based paint on equipment / structures considered too high. This would require scrape off of paint, scaffolding, work over water plus disposal of remaining waste	3 / Serious	3. / Unlikely	Medium (ALARP)
	N4	Introduction and Transmission of Invasive Species	• Displacement of existing species with detrimental effects	3 / Serious	2 / Highly Unlikely	Medium	▪ Vessel to comply with AQIS requirements. ▪ Vessels to comply with Ballast management procedures and maintain a log of ballast water discharges. ▪ Supply vessel selection process	2 / Moderate	2/ Highly Unlikely	Low (ALARP)
	N5	Disposal of workover fluids	• Discharge of chemicals into the marine environment and impact on marine species.	3 / Serious	3/ Unlikely	Medium	▪ Chemicals are subject to detailed hazardous materials risk assessment. ▪ Fluids to be pumped and discharged through existing wastewater caisson to ensure optimal dilution. Use will be made of the existing drain headers and temporary hose/pump as required. ▪ Training and competency of personnel (CCPS-13) – including use of competent workover contractors (contractor management process).	3 / Serious	1 / Remote	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
Hydrocarbon Events										
	H1	Loss of containment of diesel whilst bunkering	• Discharge of diesel into the marine environment and impact on marine species.	2 / Moderate	6 / Almost Certain	High	▪ Design – hose equipped with dry break couplings. ▪ Asset integrity program (CCPS-10.1) and Maintenance management system particularly as it relates to hose management. ▪ Training and competency of personnel (CCPS-13). ▪ Bunkering procedures require fully manned operation therefore only a limited discharge of diesel is expected before it would be identified.	1 / Minor	3. / Unlikely	Low (ALARP)
	H2	Loss of containment of diesel – supply vessel	• Discharge of diesel into the marine environment and impact on marine species.	3 / Serious	3 / Unlikely	Medium	▪ Major vessel problem (i.e. vessel collision, foundering) most credible event would lead to loss of one tank of diesel. ▪ Vessel operating procedures and processes including training, navigation, adverse weather procedure, design and maintenance. ▪ Oil Spill Contingency Plan.	3 / Serious	1 / Remote	Low (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	H3	Loss of containment of hydrocarbons – Topsides event	• Discharge of gas to the atmosphere and condensate into the marine environment and impact on marine species.	2 / Moderate	6 / Almost Certain	High	▪ Event limited to platform topsides inventory (approximately $10m^3$ of condensate and $70m^3$ of gas), if event escalates and the platform fails structurally the surface controlled sub surface safety valves (SC-SSSV) are designed to prevent continued discharge of hydrocarbons. If they fail, result is effectively a blowout as per H4, see below. ▪ All critical controls i.e. design, asset integrity, operating procedures, process shutdowns, emergency shutdowns including SC-SSSVs, etc. ▪ Oil Spill Contingency Plan. ▪ Training and competency of personnel operating platform (CCPS-13). Additional controls considered but rejected: ▪ Consider additional equipment for oil in water monitoring. This was not supported due to platform space constraints and process equipment modifications would be significant.	2 / Moderate	3 / Unlikely	Medium (ALARP)
	H4	Loss of containment of hydrocarbons – Blowout	• Discharge of gas and condensate into the marine environment and impact on marine species.	2 / Moderate	5 / Likely	High	▪ All critical controls as identified in the safety case and WOMP, i.e. design, asset integrity, operating procedures, process shutdowns, emergency shutdowns particularly SC-SSSVs, etc. ▪ Oil Spill Contingency Plan. ▪ Training and competency of personnel operating platform (CCPS-13).	4 / Moderate	1 / Highly Unlikely	Medium (ALARP)

Aspect	Risk ID	Hazard	Potential Impact	Risk with no controls in place			Key Control Measures and other considerations	Risk with controls in place		
				Consequence	Likelihood	Inherent Risk		Consequence	Likelihood	Residual Risk
	H5	Loss of containment of hydrocarbons – Pipeline event.	• Discharge of condensate into the marine environment and impact on marine species.	3 / Serious	6 / Almost Certain	Severe	▪ Failure could occur close to shore and hence result in shoreline impacts. Pipeline contains approx 20 m^3 of condensate. ▪ Major pipeline failure resulting in loss of pipeline contents. Platform would be shutdown and continued production feeding the loss of containment would stop. ▪ Design, process control alarms and trips (CCPS-02). ▪ All critical controls i.e. design, asset integrity, operating procedures, process shutdowns and emergency shutdowns, etc. ▪ Asset integrity program (CCPS-10.1) and Maintenance management system. ▪ Oil Spill Contingency Plan. Additional controls considered but rejected: ▪ Install NRV at pipeline shore crossing and / or actuate existing first valve on shore at Kilcunda to reduce pipeline leak inventory. This was rejected based on the risks and costs of installation. ▪ Installation of concrete mattresses along pipeline route to provide additional impact protection. This was rejected due to based on the risks and costs of installation.	4 / Serious	1 / Remote	Medium (ALARP)

5. Origin Corporate Environment Policy

Origin's Health, Safety and Environment (HSE) Policy provides a public statement of the company's commitment to minimise adverse effects on the environment and to improve environmental performance continuously.

Origin commits to:

- Eliminate or manage hazards and practices that could cause accident, injury or illness to people, damage to property or unacceptable impacts on the environment.
- Assist all employees to meet their health, safety and environment obligations; and
- Conduct all activities in recognition of short and long term economic, environmental and community considerations.

This commitment is backed by Origin's HSE policy which requires:

- Integrating HSE management into the planning and operation of all Origin Energy's businesses.
- Allocating clear lines of accountability to implement HSE policy and communicate effectively the principles by which Origin Energy operates.
- Providing systems to identify, classify, assess, control and review HSE risks in all areas.
- Establishing and communicating documented processes to control risks and effectively manage incidents.
- Ensuring that adequate human resources, with appropriate training and qualifications, are provided to manage, maintain and implement HSE systems and controls.
- Developing, implementing and maintaining systems for work procedures that will be reviewed regularly as appropriate.
- Ensuring communication channels are available to provide staff with relevant HSE information;
- Measuring, monitoring and reviewing HSE performance, maintaining records and reporting results to senior management, relevant authorities and other stakeholders.
- Ensuring that procedures for the purchase or supply of goods or services address HSE principles and requirements.
- Ensuring that contractors comply with the HSE standards and requirements.
- Taking all necessary steps to minimise the impact of an environmental event; and
- Taking opportunities to reduce waste and greenhouse gas emissions, conserve energy and recycle materials.

Origin (and its contractors) also operates under the Origin Corporate HSE Management System (HSEMS) to minimise and manage the impacts on employees, contractors, the environment and the communities in which the company operates. The Origin HSEMS has been developed in accordance with Australian/New Zealand Standard ISO 14001:2004 Environmental Management Systems.

Origin's focus on improving environmental management practices are supported by business unit and site level Health, Safety and Environment plans that outline specific strategies to manage energy efficiency, greenhouse gas emissions, waste, water and, where applicable, land within a

specific locality and context. They are however, implemented within the overall framework of the Origin Corporate HSEMS.

The Origin Corporate HSEMS ensures that environmental incidents and non-compliances are identified and reported to management and regulators as required and that there is a constant focus on improving management practices to reduce environmental impacts. Where incidents involving regulatory non-compliance are reported the level of routine auditing of HSE procedures will be reviewed and increased as required.

6. Environment Plan Consultation

6.1 Employee Consultation

Consultation with employees in the development of this revised EP can be demonstrated through employee participation in the Environmental Risk Assessment conducted in March 2009 and August 2011. The risk assessments were a workshop-based approach for reviewing the risk events previously identified and for identifying new risks associated with the operation of the Yolla platform and offshore pipeline (as a result of becoming a manned facility). The workshops involved a multi-disciplinary team including representatives from BassGas Management, Operations (Supervisors, Technicians and Health and Safety Representatives), Engineering, Maintenance, HSE and Supply and Logistics. The Implementation Strategy for this EP was developed based on the outcomes from the environmental risk assessment.

6.2 Consultation with the Regulator

Through the development and initial assessment of this EP, NOPSEMA has been consulted with respect to the content of the document. Feedback received from the regulatory authorities has been incorporated into this revision as have lessons learnt on the Otway Drilling Campaign Environment Plan.

6.3 Ongoing Stakeholder Consultation

Origin has developed systems to regularly assess the general community's expectations of Origin as a corporate citizen. A community Environmental Liaison Group (ELG) meeting forum has been established to respond to external feedback and engage with the general community and key regulators. The meetings, held on a quarterly basis, are open to the general community and key stakeholders and act as a consultation forum to communicate Origin's goals and HSE performance. The community consultation meetings ensure that HSE management issues arising from the operation of the BassGas project are managed to the satisfaction of the relevant regulatory authorities and the local community. Meetings are minuted, issued to all meeting participants and filed on the Origin Document Management System (DMS).

Origin has also identified and consulted with a range of stakeholders who may be affected by, or have an interest in the ongoing operations of the Yolla platform. These consultations were conducted by Origin's Community Relations Advisor and included State and Federal departments and agencies, Non Government Organisations, industry peak bodies and groups.

A fact sheet was produced and distributed to provide an overview of the Yolla MLE Project. This contained contact details for interested stakeholders to request further information or to provide feedback to Origin.

The low level of comment received was generally attributed to the location of the platform away from shipping lanes, the very low level of commercial fishing activity affected, and the fact the Yolla platform is an existing structure with a known location and safety exclusion zone. No substantive issues (claims or objections) have been identified by stakeholders during the consultation period.

The summary details of consultation following the distribution BassGas Offshore Facilities Yolla MLE Project Fact Sheet are included in Table 6-1.

. The summary table includes the following:

- a summary of the stakeholder query (objection or claim);
- Origin's assessment of the merit of the query (claims or objection) raised by the stakeholder; and
- Origin's response to the stakeholders.

Table 6-1: Summary of BassGas offshore facilities stakeholder consultation

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
Australian Marine Safety Authority (AMSA) Lead Agency in case of search and rescue or oil spill response in Commonwealth Waters.	No vessel safety concerns expressed as the platform is located in an existing exclusion zone.		
	OSCP - Initially sent relevant sections of OSCP but advised a full copy was required.	Valid	Full copy of OSCP was provided.
	Provided a detailed review of the full OSCP with a combination of observations and recommendations.	Valid	All recommendations were addressed while observations were assessed for criticality and determined if modification were required.
	AMSA requested a formal agreement with Origin.	Valid	Queried if an agreement is required per OSCP (operation, exploration, drilling, etc) or if one between AMSA and Origin is adequate. AMSA are currently considering the most appropriate approach.
Australian Hydrographic Office (AHO). Commonwealth authority responsible for notice to shipping of marine activities.			Discussion regarding location of platform and increased vessel movements. Confirmed project timeline and drilling phase.
	Will extend period for notice to mariners.	Valid	No further response required.

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
Department of Defence Naval vessel movements and charting.	Satisfied with information provided.	N/A	Discussion regarding location of platform and increased vessel movements. Confirmed project timeline and drilling phase. No further response required.
Border Protection Control Command	Satisfied with information provided.	N/A	Discussion regarding location of platform and increased vessel movements. Confirmed project timeline and drilling phase. No further response required.
Rescue Coordination Centre (RCC) – Australian Marine Safety Authority (AMSA) Lead agency in offshore search and rescue.	Satisfied with information provided.	N/A	Discussion regarding location of platform and increased vessel movements. Confirmed project timeline and drilling phase. No further response required.
Australian Marine Oil Spill Centre (AMOSC) Oil spill response organisation for Tier 2/Tier 3 spills	Provided contacts for state combat agencies (Vic/Tas). Reviewed full OSCP with minor comments including formatting errors, AMOSC capabilities and wildlife response	Valid Valid	Updated contact register. Items raised by AMOSC have been addressed and re-submitted for further review.

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
Vic DOT Combat Agency in case of oil spill in Victorian State Waters	Advised the equipment list is required to demonstrate the operator and combat agency are resourced to respond	Valid	Provided extracts of OSCP and questioned what information is required from Vic DOT. Equipment list was provided for relevant area
Tas. EPA Combat Agency in case of oil spill in Tasmanian State Waters	No further communication received.	N/A	Provided full OSCP for comment. Attempted to contact Tas EPA representative to determine status of comments.
Tas DPI – Mineral Resources Tasmania Resource management and regulator.	Tas no longer has regulatory responsibility. Appreciate being advised.	N/A	
Vic DPI Resource management and industry development regulator.	Sought clarification of project activity that relates to Victorian waters, predicted oil spill paths, ocean water quality, increased vessel activity in Vic ports, other risks identified. Vic DPI indicated they had no further concerns.	Valid	Provided details of Origin responses to hydrocarbon events, physical impacts, waste discharges and non-routine impacts as detailed in the Environmental Plan. No further response required.
Southern Squid Jig Fishery. Industry peak body	Location rarely fished.	N/A	No further response required.

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
Bass Strait Central Zone Scallop Fishery Management Authority Industry peak body.	Location rarely fished. Possible impacts on scallop beds.	Valid	Confirmed no effect on scallop beds.
Tasmanian Rock Lobster Fishermans Association Industry peak body	Location rarely fished.	N/A	No further response required.
Tasmanian South East Trawl Fishing Industry Association. Industry peak body.	No response received	N/A	No further response required.
Tasmanian Fishing Industry Council & Crustacean Fisheries Advisory Committee. Industry peak body.	No response received	N/A	No further response required.
Scallop Fisherman's Association of Tasmania. Industry peak body.	No response received	N/A	No further response required.
Commonwealth Fisheries Association. **Industry peak body**.	No response received	N/A	No further response required.
Seafood Industries Victoria. Industry peak body.	Confirmed location rarely fished.	N/A	No further response required.
BassGas Community Reference Group Local community representatives provide advice and feedback on operations and projects.	General questions and interest on Yolla MLE Project construction – no environment specific concerns.	N/A	Project information and updates to be provided at each Community Reference Group meeting.

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
TT Line Shipping company operating in Bass Strait.	Platform location not close to shipping lanes. Existing exclusion zone.	N/A	No further response required.
Toll ANL Bass Straight Shipping. Shipping company operating in Bass Strait.	Platform location not close to shipping lanes. Existing exclusion zone.	N/A	No further response required.
Tasmanian Ports Corporation. **(TasPorts)** Tasmanian ports operator.	No response received	N/A	No further response required.
URS Environmental services	Confirmed that URS can support environmental sampling and testing services.	N/A	Provided extracts of OSCP for comment as part of request for establishing a formal service agreement for URS support services. Formal service agreement in place with URS.
RPS Environmental services	Confirmed that RPS can support environmental services.	N/A	Provided extracts of OSCP for comment as part of request for establishing a formal contract for URS support services. Formal service agreement in place with RPS.

Stakeholder and potential interest in the project	Stakeholder query	Origin's assessment of Stakeholder query	Origin's response to Stakeholder
Australian Jet Provide aerial support services	Received confirmation Australasian Jet can support aerial survey	N/A	Provided extracts of OSCP for comment as part of request for establishing a formal contract for Australian Jet support services. Formal service agreement in place with Australian Jet.
Bristow Provide helicopter support services	Received confirmation that contract allows for emergency use of helicopters and Bristow have capability to conduct aerial survey	N/A	Provided extracts of OSCP for comment as part of request for establishing a formal contract for Bristow support services. Formal service agreement in place with Bristow.

7. Environment Plan Liaisons

The Origin environmental contact person for the BassGas Offshore Facilities is:

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