



# Decision Document

## *Environmental Protection Act 1986, Part V*

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**Proponent:** Bechtel (Western Australia) Pty Ltd

**Works Approval:** W5671/2014/1

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**Registered office:** 140 St Georges Tce  
PERTH WA 6000

**ACN:** 147 531 226

**Premises address:** LNG Plant Permanent Sewage Treatment Plant  
Part of Lots 567 and 569 on Plan 71345  
TALANDJI WA 6710

**Issue date:** Thursday, 4 December 2014

**Commencement date:** Monday, 8 December 2014

**Expiry date:** Thursday, 7 December 2017

### Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue a works approval. DER considers that in reaching this decision, it has taken into account all relevant considerations.

Decision Document prepared by: Fiona Esszig  
Licensing Officer

Decision Document authorised by: Alana Kidd  
Manager Licensing



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## 1 Purpose of this Document

This decision document explains how DER has assessed and determined the application for a works approval or licence, and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

### Works approval and licence conditions

DER has three types of conditions that may be imposed on works approvals and licences. They are as follows;

#### Standard conditions (SC)

DER has standard conditions that are imposed on all works approvals and licences regardless of the activities undertaken on the Premises and the information provided in the application. These are included as the following conditions on works approvals and licences:

Works approval conditions: 1.1.1-1.1.4, 1.2.1, 1.2.2, 5.1.1 and 5.1.2.

Licence conditions: 1.1.1-1.1.4, 1.2.1-1.2.4, 5.1.1-5.1.4 and 5.2.1.

For such conditions, justification within the Decision Document is not provided.

#### Optional standard conditions (OSC)

In the interests of regulatory consistency DER has a set of optional standard conditions that can be imposed on works approvals and licences. DER will include optional standard conditions as necessary, and are likely to constitute the majority of conditions in any licence. The inclusion of any optional standard conditions is justified in Section 4 of this document.

#### Non standard conditions (NSC)

Where the proposed activities require conditions outside the standard conditions suite DER will impose one or more non-standard conditions. These include both premises and sector specific conditions, and are likely to occur within few licences. Where used, justification for the application of these conditions will be included in Section 4.



## 2 Administrative summary

Administrative details		
Application type	Works Approval <input checked="" type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input type="checkbox"/> Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	54	225.6 m <sup>3</sup> /day
Application verified	Date: 1 May 2014	
Application fee paid	Date: 26 May 2014	
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Commercial-in-confidence claim outcome	N/A.	
Is the proposal a Major Resource Project?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Part of Wheatstone Project	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input checked="" type="checkbox"/>
Is the proposal subject to Ministerial Conditions?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Ministerial statement No: 873 EPA Report No: 1401
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i> )?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Department of Water consulted Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, include details here, eg Site is subject to SO <sub>2</sub> requirements of Kwinana EPP.		



### 3 Executive summary of proposal

This works approval is for the LNG (liquefied natural gas) Plant Permanent Facilities Sewage Treatment Plant (STP) and associated marine outfall.

The STP, which is proposed to support the operation of the Wheatstone Project, will treat sewage associated with the permanent facilities located at the Wheatstone LNG Plant site, situated approximately 12 kilometres (km) south-west of Onslow.

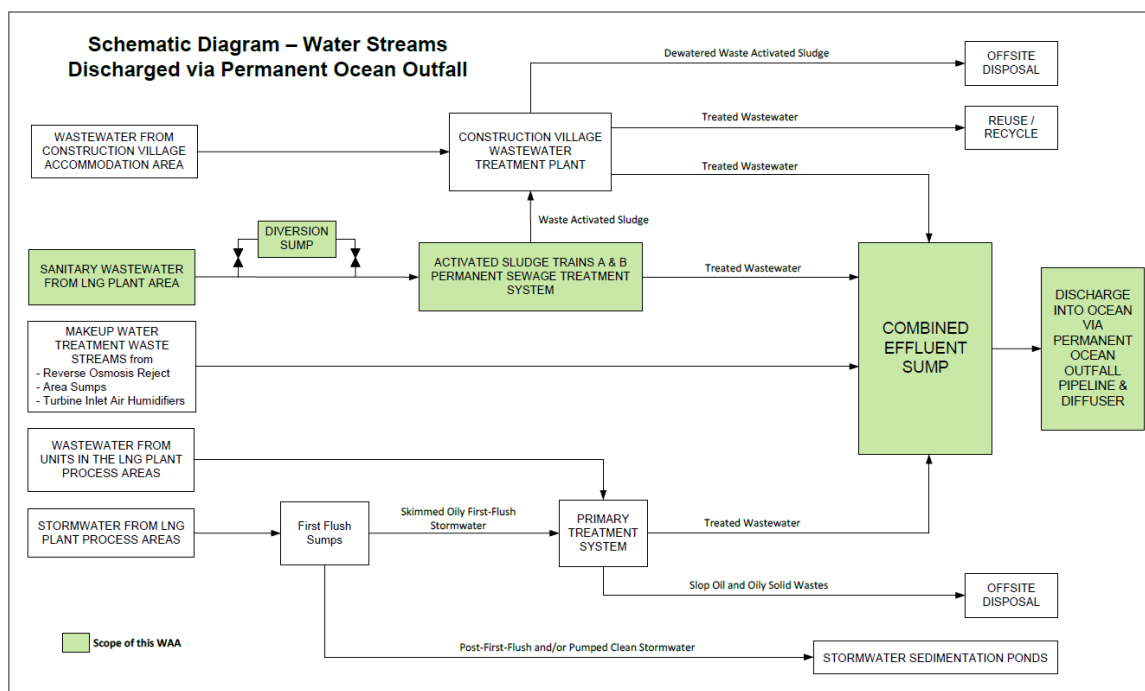
The system is an Activated Sludge Plant (ASP), which uses an aerobic biological treatment system process, and has a design capacity of 28.8 cubic metres per day (m<sup>3</sup>/day).

Treated effluent from the LNG STP will be combined with brine from a reverse osmosis (RO) plant, treated effluent from the Construction Village STP and treated effluent from the LNG Plant Primary Treatment System, prior to discharging to the ocean outfall (Figure 1). The Primary Treatment System is designed to treat potentially polluted stormwater and process water associated with the LNG and Domestic Gas Plants by removing free oil and suspended solids. Construction of the Primary Treatment System and associated stormwater infrastructure was approved under works approval (W5584/2013/1).

Treated effluent from the Construction Village STP (approved under works approval W5306/2012/1) is currently disposed of via irrigation, and will eventually be discharged to the temporary outfall (W5439/2013/1). Once the permanent ocean outfall becomes available as a disposal option, the waste stream will be redirected to the permanent outfall.

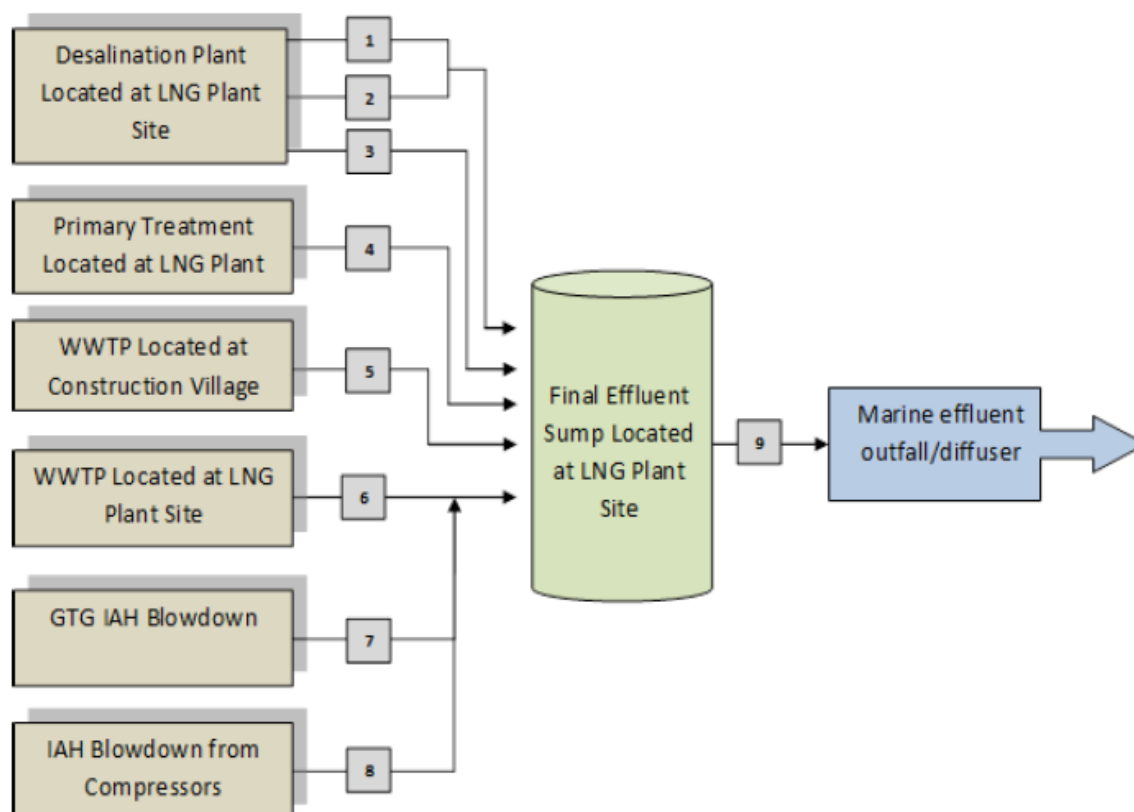
The RO plant does not trigger the requirement for a works approval as it is below the 10 gigalitre per year production threshold for category 54A under the *Environmental Protection Regulations 1987*.

The waste streams will be directed to combined wastewater equalisation storage tanks, which will provide a steady flow of wastewater to the ocean outfall.



**Figure 1: Diagram showing the wastewater streams associated with the permanent outfall.**

It is anticipated that 6,617 m<sup>3</sup> of wastewater will be discharged to the outfall per day. A breakdown of the types of wastewater is shown in Figure 2.



Stream Number	Description	Volume (m <sup>3</sup> /hour) <sup>1</sup>
1	Sea water reverse osmosis reject (SWRO and BWRO units)	183
2	UMF backwash	50
3	UF backwash	
4	Treated effluent from LNG Primary Treatment Facility	1
5	Treated effluence from Construction Village STP	8.2
6	Treated effluent from LNG Plant Permanent STP	1.2
7	GTG IAH blowdown	8.1
8	IAH blowdown from compressor driver turbines	24.2
9	<b>TOTAL</b>	<b>275.7</b>

Note 1: Volumes based on summer operations showing maximum flow to the outfall with typical concentrations of constituents.

\* The Construction Village STP consists of 4 trains each with the capacity to treat 480m<sup>3</sup>/day, however, only 196.8m<sup>3</sup>/day is anticipated to be discharged to the outfall.

**Figure 2: Process diagram showing volume of waste from the various waste streams discharged to the outfall.**

The decision table below includes justification for the conditions applied to the works approval relating to the construction and commissioning of the LNG Plant Permanent Facilities STP and outfall. It also contains justification for the licence conditions that may be included on the subsequent operating licence. It should be noted however, that the licence conditions recommended in the decision table are not final and may change following commissioning and validation monitoring.



## 4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and, DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
General conditions	W1.2.3 and W1.2.4	NSC	The commissioning and operation of the outfall will be in stages as infrastructure comes online. Wet commissioning of each stage will occur for a period of three months and involves system testing to achieve stable operations. Validation commissioning will occur over a 6 week period once the system is operating normally. Validation commissioning will include water quality monitoring at the mixing zone to verify that the discharge is meeting design specifications. Refer to Appendix A for further information. NSC 1.2.3 and 1.2.4 allow for commissioning and validation commissioning.	Application supporting documentation  Ministerial Statement 873 (MS873)  Wheatstone Project, Permanent Onshore Facilities Waste Water Discharge Plan
Premises operation	W1.3  L1.3.1 – L1.3.4	NSC  OSC/NSC	<u>Emission Description</u> <i>Emission:</i> Overflow or spills of treated wastewater from the Combined Effluent Sump. <i>Impact:</i> Localised impacts to adjacent land and groundwater by wastewater which potentially contains nutrients, metals, high total dissolved solids and hydrocarbons. Groundwater in the area is shallow (approximately 0.5m below ground level). <i>Controls:</i> The Combined Effluent Sump is a concrete sump. A freeboard of 300mm will be maintained at all times.  <u>Risk Assessment</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low	Application supporting documentation  <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>



DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
			<p><u>Regulatory Controls</u> OSC 1.3.2 will be included on the licence and set waste acceptance criteria to ensure that only approved wastewater streams are treated on site. OSC 1.3.3 will specify process limits for the volume of wastewater treated to ensure that the Premises does not exceed the approved treatment capacity. OSC 1.3.1 will be included on the licence ensuring that exceedances of any descriptive or numeric limit or target is investigated and recorded.</p> <p>NSC 1.3.4 will be included on the licence setting containment and freeboard requirements for the Combined Effluent Sump. Condition 1.3.1 has been included on the works approval to ensure that the freeboard is maintained during commissioning.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low</p>	
<b>Emissions general</b>	W2 L2.1	N/A OSC	Targets will be set through condition 2.3 of the licence and therefore OSC regarding recording and investigation of exceedances of limits or targets will be included in the licence.	N/A
<b>Point source emissions to air including monitoring</b>	W2 and W3 L2.2 and L3.2	NA	<p><b>Construction and Operation</b> No significant point source air emissions are expected from the construction or operation of the Permanent STP. No specified conditions relating to point source emissions to air or the monitoring of these emissions are required to be added to the works approval or licence.</p>	<p>Application supporting documentation</p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i></p>
<b>Point source emissions to surface water</b>	W2.1 – 2.1.3 & W3.1.1 – 3.1.4	N/A	<p><b>Construction</b> No significant point source emissions to surface water are expected from the construction of the Permanent STP. No specified conditions</p>	Application supporting documentation





DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
including monitoring	L2.3 and L3.3	OSC	relating to point source emissions to surface water or the monitoring of these emissions are required to be added to the works approval.  <b>Commissioning and Operation</b> Details of DER's assessment and decision making are included in Appendix A.	Australian and New Zealand guidelines for fresh and marine water quality – 2000  Ministerial Statement 873 (MS873)  Wheatstone Project, Permanent Onshore Facilities Waste Water Discharge Plan
Point source emissions to groundwater including monitoring	W2 and W3  L2.4 and L3.4	NA	<b>Construction and Operation</b> No significant point source emissions to groundwater are expected from the construction or operation of the Permanent STP. No specified conditions relating to point source emissions to groundwater or the monitoring of these emissions are required to be added to the works approval or licence.	Application supporting documentation  <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>
Emissions to land including monitoring	W2 and W3  L2.5 and L3.5	NA	<b>Construction and Operation</b> No significant emissions to land are expected from the construction or operation of the Permanent STP. No specified conditions relating to emissions to land or the monitoring of these emissions are required to be added to the works approval or licence.	Application supporting documentation  <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>
Fugitive emissions	W2  L2.6	NA	<b>Construction</b> <u>Emission Description</u> <i>Emission:</i> Dust emissions from vehicle and equipment movement. <i>Impact:</i> Reduced local air quality and nuisance dust. <i>Controls:</i> Dust emissions will be temporary during construction only and measures such as water spraying on roads and works areas and vehicle speed restrictions will be implemented. The use of gravel or dust suppressants will be implemented where practicable. Routine	Application supporting documentation  Wheatstone Project Conservation Significant Marine Fauna Interaction Management Plan  MS873





DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
			<p>visual inspections will also occur to ensure that dust is not excessive.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> Due to minimal environmental risk, there are no specified conditions relating to dust are proposed.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low</p> <p><b>Operation</b> No significant dust emissions are expected during operation of the STP or outfall.</p> <p><b>Construction</b> No significant light emissions are expected during construction. Construction activities will occur predominantly during daylight hours.</p> <p><b>Commissioning and Operation</b> <u>Emission Description</u> <i>Emission:</i> Light emissions from plant and equipment. <i>Impact:</i> Disturbance to nesting turtles. The nearest known turtle nesting beach is located approximately 4km to the south-west. <i>Controls:</i> No metal halides, mercury vapour fixtures, white or ultraviolet lights will be used and lighting will be focused downwards to reduce</p>	



DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
			<p>overhead glow. Commissioning and operation of the LNG STP will be 24 hours a day, 7 days a week. Assessment of lighting conducted for the LNG Plant indicates that the impact from lighting will be minimal. In comparison to lighting from the LNG Plant, lighting from the STP is not considered to be significant.</p> <p><u>Risk Assessment</u>  <i>Consequence:</i> Insignificant  <i>Likelihood:</i> Unlikely  <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u>            No specified conditions relating to lighting are required.</p> <p><u>Residual Risk</u>  <i>Consequence:</i> Insignificant  <i>Likelihood:</i> Unlikely  <i>Risk Rating:</i> Low</p>	
<b>Odour</b>	W2  L2.7	NA	<p><b>Construction</b>            No significant odour emissions are expected during construction.</p> <p><b>Commissioning and Operation</b>  <u>Emission Description</u>  <i>Emission:</i> Odour emissions from plant and equipment.  <i>Impact:</i> Nuisance odours from wastewater processing and storage. The nearest sensitive receptor is the Brolga Camp which is located 2km away.  <i>Controls:</i> The equalisation tank containing raw sewage is a closed top tank. Measures such as high levels alarms, visual inspections of the plant, and regular maintenance will also assist in reducing odours from malfunctions or spills.</p>	Application supporting documentation



DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
			<p><u>Risk Assessment</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> No specified conditions relating to odour are recommended.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low</p>	
Noise	W2  L2.8	NA	<p><b>Construction and Operation</b></p> <p><b>Commissioning and Operation</b></p> <p><u>Emission Description</u> <i>Emission:</i> Noise emissions from plant and equipment. <i>Impact:</i> Nuisance noise impacting people. Onslow is located 12km away. <i>Controls:</i> The facility will be operated in accordance with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> No specified conditions relating to odour are recommended.</p>	Application supporting documentation  <i>Environmental Protection (Noise) Regulations 1997</i>



DECISION TABLE				
Works Approval / Licence section	Condition number W = Works Approval L = Licence	OSC or NSC	Justification (including risk description & decision methodology where relevant)	Reference documents
			<u>Residual Risk</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low	
<b>Monitoring general</b>	W3.1.1 L3.1	OSC	Standard general monitoring conditions will be included on the works approval and licence, requiring monitoring to be carried out in accordance with relevant Australian Standards and by laboratories with NATA (National Association of Testing Authorities) accreditation.	AS/NZS 5667.1 – Water Quality – Sampling – Guidance on the Design of sampling programs, sampling techniques and the preservation and handling of samples
<b>Monitoring of inputs and outputs</b>	W3 L3.6	OSC	<p>Sludge produced from the STP will be stored in the integrated sludge storage tank. Vacuum trucks will be used to remove sludge from the tanks for transfer to the Construction Village STP for dewatering prior to being removed offsite by a licensed contractor. Approximately 0.4 m<sup>3</sup> of sludge will be generated per day.</p> <p>The STP will have the capacity to treat 28.8m<sup>3</sup> of effluent per day. The volume of treated sewage from the STP and the Construction Village STP is expected to be approximately 225.6m<sup>3</sup>/day (this may vary depending on workforce requirements during shutdowns of the LNG Plant). The total volume of wastewater (i.e. treated effluent from the STPs and other wastes) discharged to the outfall is estimated to be 6617 m<sup>3</sup>/day. OSC requiring the monitoring of volumes discharged to the outfall will be required on the licence.</p>	<p>Application supporting documentation.</p> <p><i>Environmental Protection (Controlled Waste) Regulations 2004.</i></p>
<b>Process monitoring</b>	W3 L3	N/A	No specified conditions relating to process monitoring are proposed on the works approval or licence.	
<b>Ambient quality monitoring</b>	W3 L3.8	NSC	Monitoring of the mixing zone will occur following commissioning whilst the outfall is operating to verify model predictions and ensure that the Environmental Quality Criteria (EQC) set at the boundary of the mixing zone are being met.	<p>Application supporting documentation.</p> <p>MS873</p>



<b>DECISION TABLE</b>				
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L = Licence</b>	<b>OSC or NSC</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
			<p>Model validation monitoring will be conducted in accordance with the Permanent Onshore Facilities Waste Water Discharge Plan and will occur on a weekly basis over a six week period commencing after the completion of wet commissioning. Monitoring will be conducted at 12 impact sites (6 at the boundary of the Low Level of Ecological Protection (LEP) area and 6 at the boundary of the High LEP area) and 6 reference sites.</p> <p>An operational water quality monitoring and management plan will be required to be submitted with the licence application detailing monitoring to be conducted during the operational phase. Operational monitoring of the Low LEP area and High LEP area will be required to continue during operations to ensure that modelled results are validated over a full suite of seasonal conditions.</p> <p>Refer to Appendix A for further details.</p>	Permanent Onshore Facilities Waste Water Discharge Plan
<b>Meteorological monitoring</b>	W3 L3	N/A	No meteorological monitoring is required and as such there are no specified conditions.	N/A.
<b>Improvements</b>	W4 L4	N/A	No specified conditions relating to improvements are required on the works approval.	N/A.
<b>Information</b>	W5 L5.1 and L5.2	OSC	<p>The proponent will be required to submit a commissioning report detailing the results of monitoring undertaken in accordance with the Permanent Onshore Facilities Waste Water Discharge Plan and the works approval conditions. Where targets or limits have not been met, the commissioning report will need to provide details of any contingency measures implemented.</p> <p>Refer to Appendix A for further information.</p>	<p>Application supporting document</p> <p>MS873</p> <p>Permanent Onshore Facilities Waste Water Discharge Plan</p>



## 5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
26/5/2014	Application advertised in The West Australian (or other relevant newspaper)	None received	NA
30/10/2014	Proponent sent a copy of draft instrument	Minor amendments requested to align conditions with the POFWDP	Minor updates made to works approval document.



## 6 Risk assessment

*Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management*

**Table 1: Emissions Risk Matrix**

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



## Appendix A

### 1. Point source emissions to surface water including monitoring

Discharge to water will be via a single outfall situated adjacent to the LNG berth of the Product Loading Facility (Figure 3). The location of the outfall was approved by the Minister for Environment via conditions 13-2 and 13-4 of MS873. The outfall features a diffuser assembly consisting of 20 duckbill ports arranged in a manifold 90 m long. Discharge ports are located off the seabed and are positioned on the offshore (north east) side of the diffuser pipe to direct effluent away from the intake pipe.



**Figure 3. Location of the permanent outfall and areas of Low, Moderate and High Ecological Protection.**



A set of Environmental Quality Objectives (EQO) for the Wheatstone Project has been developed under Schedule 2 of MS873 (Table 1).

**Table 1. Environmental values and environmental quality objectives**

Environmental Value	EQO
Ecosystem health	Maintenance of ecosystem integrity
Fishing	Maintenance of seafood for human consumption
Aquaculture	Maintenance of aquaculture
Industrial water supply	Maintenance of industrial water supply
Recreation	Maintenance of primary and secondary contact recreation
Aesthetic	Maintenance of aesthetic values
Cultural and spiritual values	Maintenance of cultural and spiritual values

LEP to ensure that EQO are achieved and ecosystem integrity is maintained have also been set through Ministerial Statement 873 as below (and shown in Figure 4):

- **Low LEP** - Area within a 70m radius of the diffuser discharge;
- **Moderate LEP** - Marine waters beyond this 70m and within 250m of the ship turning basin and berthing areas, and area enclosed by the Marine Offloading Facility breakwaters; and
- **High LEP** - Anything outside of these two areas.

To determine if EQO are being achieved, a set of Environmental Quality Criteria (EQC) are required that measure chemical and physical water quality parameters relevant for baseline water quality conditions at the location of the discharge and the constituents contained in the waste stream. EQC are derived from a combination of results of baseline water quality monitoring, the ANZECC/ARMCANZ *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) and the *Manual of Operating Procedures for Environmental Monitoring Against the Cockburn Sound Environmental Quality Criteria* (2005). EQC are shown in Table 1.

The receiving marine environment is generally shallow (ranges in depth from 5 m to 15 m) and experiences semi-diurnal tides with a spring tidal range of 1.9 m. Seagrass and coral coverage is sparse and not abundant in the area. Marine water adjacent to the Wheatstone LNG Project, with the exception of areas surrounding the existing dredge material placement areas and the Onslow Salt discharge, jetty and berths, have been allocated a High LEP.

Threatened and migratory species of birds, marine mammals, reptiles and sharks/rays are known to be present in the nearshore and offshore marine environments of the Wheatstone Project. These include dugongs, sawfish, marine turtles and humpback whales. Turtle nesting occurs on offshore islands including Thevenard, Locker and Ashburton Islands, and whilst some nesting occurs on mainland beaches, the nearest nesting beach is 4km from the Wheatstone Project shorefront.

### 1.1. Waste composition

Waste discharged via the outfall will consist of various streams as shown in Figure 2. Table 2 provides details of the wastewater characteristics of the waste streams compared against EQC set for the areas of Moderate and High LEP.



**Table 2. Discharge characteristics and EQC.**

Parameter	Discharge concentration <sup>1</sup>	Moderate LEP	High LEP
Residual chlorine	28.97 µg/L	Median < Reference 95 <sup>th</sup> percentile	3 µg/L & median < Reference 80 <sup>th</sup> percentile
Aluminium	13.88 µg/L	Median < Reference 95 <sup>th</sup> percentile	0.5 & median < Reference 80 <sup>th</sup> percentile
Cadmium	0.83 µg/L	14 µg/L	0.7 µg/L
Chromium (III)	1.39 µg/L	49 µg/L	7.7 µg/L
Chromium (VI)	1.39 µg/L	20 µg/L	0.14 µg/L
Copper	1.39 µg/L	3 µg/L	0.3 µg/L
Lead	13.88 µg/L	6.6 µg/L	2.2 µg/L
Mercury	0.07 µg/L	0.7 µg/L	0.1 µg/L
Nickel	8.74 µg/L	200 µg/L	7 µg/L
Silver	13.89 µg/L	1.8 µg/L	0.8 µg/L
Vanadium	2.37 µg/L	160 µg/L	50 µg/L
Zinc	12.22 µg/L	23 µg/L	7 µg/L
Total Recoverable Hydrocarbons	1.33 mg/L	250 µg/L & median < Reference 95 <sup>th</sup> percentile	250 µg/L & median < Reference 80 <sup>th</sup> percentile
		C6-C9: 25 µg/L & median < Reference 95 <sup>th</sup> percentile	C6-C9: 25 µg/L & median < Reference 80 <sup>th</sup> percentile
		C10-C14: 25 µg/L & median < Reference 95 <sup>th</sup> percentile	C10-C14: 25 µg/L & median < Reference 80 <sup>th</sup> percentile
		C15-C28: 100 µg/L & median < Reference 95 <sup>th</sup> percentile	C15-C28: 100 µg/L & median < Reference 80 <sup>th</sup> percentile
		C29-C36: 100 µg/L & median < Reference 95 <sup>th</sup> percentile	C29-C36: 100 µg/L & median < Reference 80 <sup>th</sup> percentile
Total dissolved solids	54,929 mg/L	39,500 mg/L and median < Reference 95 <sup>th</sup> percentile	39,400 mg/L and median < Reference 80 <sup>th</sup> percentile
Total Nitrogen	5,165 µg/L	260 µg/L and median < Reference 95 <sup>th</sup> percentile	225 µg/L and median < Reference 80 <sup>th</sup> percentile
NOx (nitrate + nitrite)	12.64 µg/L	16.6 µg/L and median < Reference 95 <sup>th</sup> percentile	12 µg/L and median < Reference 80 <sup>th</sup> percentile
Total Phosphorus	582 µg/L	17.5 µg/L and median < Reference 95 <sup>th</sup> percentile	7.5 µg/L and median < Reference 80 <sup>th</sup> percentile
Filterable Reactive Phosphorus	4.44 µg/L	4 µg/L and median < Reference 95 <sup>th</sup> percentile	3.3 µg/L and median < Reference 80 <sup>th</sup> percentile
Temperature – Winter	Min. 24.8 °C	26.2 °C and median < Reference 95 <sup>th</sup> percentile	23.4 °C and median < Reference 80 <sup>th</sup> percentile
Temperature – Summer	Max. 31.9 °C	30.2 °C and median < Reference 95 <sup>th</sup> percentile	29.4 °C and median < Reference 80 <sup>th</sup> percentile
Chlorophyll-a	NA	1.4 µg/L and median < Reference 95 <sup>th</sup> percentile	1.4 µg/L and median < Reference 80 <sup>th</sup> percentile
pH	6-9	Median between Reference 5 <sup>th</sup> & 95 <sup>th</sup> percentile	Median between Reference 20 <sup>th</sup> & 80 <sup>th</sup> percentile
Turbidity	49.53 NTU	Median < Reference 95 <sup>th</sup> percentile	Median < Reference 80 <sup>th</sup> percentile
Dissolved oxygen	93 % Saturation	6 week median at any site within 0.5m of seafloor <= 80% Saturation	6 week median at any site within 0.5m of seafloor <= 90% Saturation
Faecal coliforms	15.03 organisms/100mL	Various EQC to achieve different EQOs	

Note 1: Effluent character will vary depend on intake seawater concentrations and the expected operation for the desalination plant. Maximum concentrations across summer and winter ambient conditions are provided.



### 1.2. Discharge monitoring

Wet commissioning will be required to enable the components to be brought online and achieve optimal operating conditions. This is expected to occur for a period of three months for each system. During this time, water quality will be sampled exiting the Final Effluent Sump on a weekly basis to monitor performance. Once stable operations are achieved, validation commissioning will commence and weekly monitoring will continue during this period. A summary of “end of pipe” monitoring to be conducted is shown in Table 3.

**Table 3. Monitoring to be conducted during wet commissioning and validation commissioning.**

Parameter	Frequency
Flow rate	Continuous
Residual chlorine	
Total dissolved solids	
pH	
Turbidity	
Temperature	
Aluminium	Weekly
Cadmium	
Chromium (III/VI)	
Copper	
Lead	
Mercury	
Nickel	
Silver	
Vanadium	
Zinc	
Total recoverable hydrocarbons & individual carbon chains	
Total nitrogen	
NOx (nitrate and nitrite)	
Total phosphorus	
Filterable reactive phosphorus	
Dissolved oxygen	
Faecal coliform	

### 1.3. Environmental monitoring (validation commissioning)

Monitoring of the mixing zone will occur following wet commissioning to verify model predictions and ensure that the EQC set at the boundary of the mixing zone are being met. Model validation monitoring will be conducted in accordance with the POFWWDP and will occur on a weekly basis over a six week period following the completion of wet commissioning. Samples will be taken 1m from the surface and 0.5m from the seafloor, and will be analysed for the parameters listed in Table 2 to determine compliance with corresponding EQC.

Monitoring will be conducted at 12 impact sites (6 at the boundary of the Low LEP area and 6 at the boundary of the High LEP area) and 6 reference sites (Figure 4). Impact sites will be located uniformly around boundary or the Low LEP area and on the eastern and western edge of the Moderate LEP boundary as the model indicated that the plume typically oscillating parallel to the coastline in these directions.

Reference sites have been selected to match conditions experienced at the outfall location without the influence of the discharge. The 6 sites are located in an area that will be subject to exactly the same natural and non-discharge anthropogenic influences as the potential impact sites.

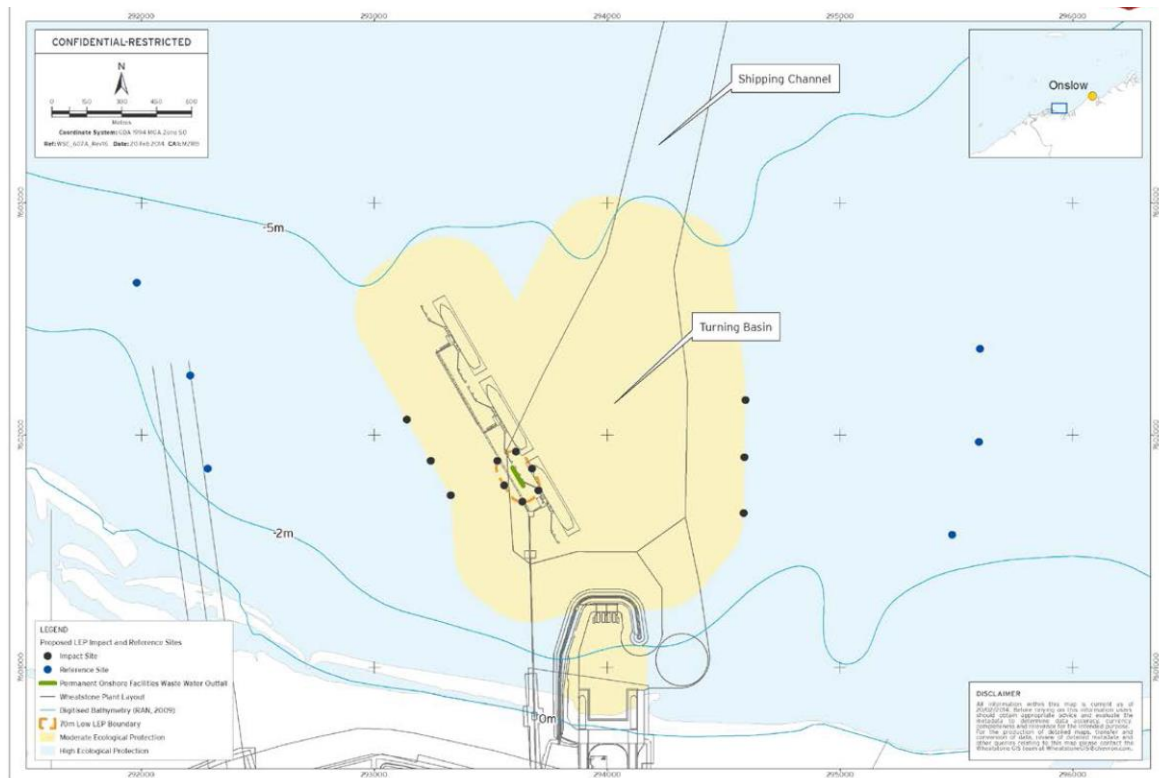


Figure 4. Location of impact (black) and reference sites (blue).

#### 1.4. Whole effluent toxicity (WET) testing

WET testing will be conducted on samples of the co-mingled wastewater to identify the potential toxicity of the effluent. WET testing involves exposing organisms to different concentrations of the effluent and assessing growth or reproductive characteristics. The proposed WET testing program will involve two processes:

1. Range find testing for toxicity to determine if the effluent at the outfall is toxic and, if so, the concentration range relevant for further testing; and
2. Definitive toxicity testing to determine the values for the effluent in a particular species.

Definitive toxicity testing will also be used to determine the number of dilutions required to achieve each LEP.

WET testing will be undertaken on a minimum of five locally relevant species from four taxonomic groups using the following tests (noting consideration of other species is possible if these species are unavailable):

1. 72-hour microalgal growth inhibition test using *Nitzschia closterium*;
2. 48-hour larval abnormality test using *Saccostrea echinata*;
3. 72-hour larval development test using *Heliocidaris tuberculata*;
4. 96-hour acute toxicity test using *Penaeus monodon* or *Melita plumulosa*; and
5. 96-hour Fish Imbalance test using *Lates calcarifer*.

#### 1.5. Contingency management

Contingency wastewater management measures will be implemented to manage exceedances under various conditions such as:

1. Planned operations, which relate to exceedances of trigger values and EQC associated with planned discharges to the marine environment under typical operating conditions; and
2. Unplanned events, which relate to unplanned events including cyclonic events, equipment breakdown, etc. and are aimed at protecting construction personnel and avoiding/minimising potential impacts to sensitive onshore receptors such as surface and ground water.





Contingency management is focused on potential breaches of trigger values and EQC under typical operating conditions, and provide direction and recommendations for ensuring that EQC are not exceeded and associated LEP are maintained. In the event that the treatment systems and permanent wastewater outfall are unable to achieve the intended objectives (required dilutions and/or EQC), solutions will be promptly investigated to mitigate the event. There are a number of potential operational and design solutions that may be implemented in response to trigger exceedances including:

- Conducting additional field studies or monitoring;
- Adjusting flow rates;
- Redirecting effluent to temporary storage onsite for later recirculation/recycling through the STPs;
- Changing management and treatment of wastewater (e.g. isolation of particular stream(s) of concern and implementing modifications to the STP);
- Injecting seawater into the combined wastewater equalisation tank to achieve further dilution;
- Investigating additional options for reuse;
- Transporting waste offsite by a licensed controlled waste contractor;
- Modifying equipment/facilities (e.g. adding an additional treatment method for the constituents of concern, replacing a particular treatment with other equivalent or improved techniques;
- Adding another processing train(s) to the STP; and
- Modifying or relocating the diffuser.

In the event of an exceedance requiring intervention, the first step will be to determine the cause related to design or operational parameters (such as design model, monitoring error, discharge rates/volumes, met-oceanic conditions, etc.). Contingency options for potential long-term issues depend upon the constituents within the effluent stream of concern and the risk they pose to the environment. The results of the option selection process will be reported to the DER and the OEPA.

### ***Emission Risk Assessment – Commissioning and Operation***

#### Emission Description

*Emission:* Wastewater from the Final Effluent Sump

*Impact:* Water quality exceeds EQC for Low, Moderate and High LEP and reduced water quality adversely impacting on marine flora and fauna. Impacts can include nutrient enrichment causing algal blooms, toxic effects on marine fauna, increased turbidity, etc. Modelling indicates that EQC will be achieved at the LEP boundaries. EQC have been derived from background concentrations and ANZECC guidelines (*Australian and New Zealand guidelines for fresh and marine water quality*, 2000).

*Controls:* Effluent will be discharged via an outfall diffuser to enhance mixing. Monitoring will occur during commissioning, validation commissioning and normal operations as above. Triggers have been set and if exceeded management action will be implemented. This can include additional monitoring and investigation, recirculating wastewater to improve treatment or design changes. WET testing will also be conducted during validation commissioning to evaluate predicted dilutions and subsequently derive a revised set of EQC for ongoing monitoring. Monitoring programs and contingency procedures are outlined in the POFWWDP.

#### Risk Assessment

*Consequence:* Minor

*Likelihood:* Unlikely

*Risk Rating:* Moderate

#### Regulatory Controls

Targets have been included on the works approval for discharge quality through conditions 2.1.1. Targets reflecting EQC set through the POFWWDP have also been set, through condition 2.1.3, at the Low-Moderate and Moderate-High LEP boundaries. In line with MS873, a limit for dissolved oxygen has been set under condition 2.1.2 at the Moderate-High LEP boundary.



Monitoring requirements during commissioning of the outfall and LNG Plant STP have been set through conditions 3.1.2 and 3.1.3 of the works approval.

As per the OEPA's recommendation in Report 1404, an operational water quality monitoring and management plan will be required to be submitted with the licence application, detailing proposed operational monitoring procedures. Monitoring at the impact and reference sites will be required to continue during operation of the outfall to capture seasonal variation and ensure that EQC are not exceeded under varying seasonal conditions. The licence will reflect commitments made in the operational water quality monitoring and management plan regarding monitoring and the setting of limits and targets.

Residual Risk

*Consequence:* Minor

*Likelihood:* Rare

*Risk Rating:* Low